

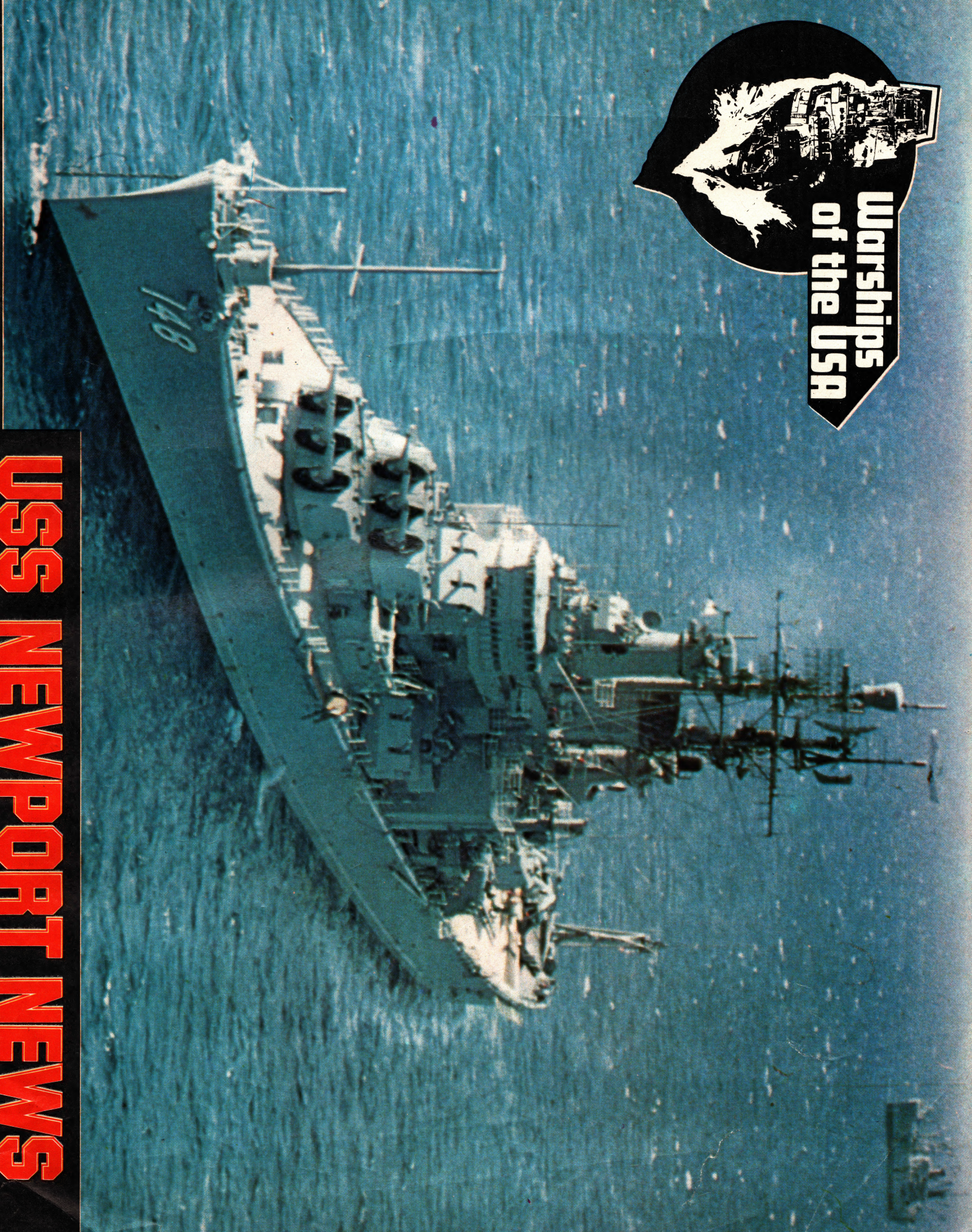
12p Weekly No. 59 May 2-9, 1975

Speed & Power

**100 MPH
MAGPIE!**



**TRAINS
SHIPS CARS
SCIENCE FICTION
PLANES**



US NEWPORT NEWS

t2

Contents

Warships of the USA.....	2	Warplanes of the world	16
Cars from clay and computers	4	Story of the airship.....	18
Into the jaws of death.....	7	SOS International	21
100mph Magpie.....	10	Clemenceau, French super carrier..	23
Sleeping at speed	12	The shining ones.....	26
Slowest race of the year.....	14	Crossword and quiz.....	29
		Model spot	30
		World trucks	32

ON THE COVER: Screaming tyres slinging mud, gravel and spray, an international rally car thrills spectators—and the driver! Mick Robertson of Thames Television's "Magpie" tried his hand and really got a taste for the hustling, bustling rally scene. Read all about it on page 10.

Readers' Letters

£1 paid for every letter published.



TAMED TIGER

I only just realised when I was looking through my back copies of *SPEED & POWER*, that in issue No. 4 on April 12, 1974 there was an article called "Taming The Tigers" which included a GT.40 reg. no. AHK 940F.

This car was re-built in Willie Green's workshop on London Road, Derby, by my brother Steve Dakin and his friend Brian Morley.

Andrew Dakin,
Allestree, Derby.
Here is a picture of AHK940F. —Ed.

BARGAIN TANK

In *SPEED & POWER* you had an article about tanks, one of them was called the Churchill. A few days after reading the article I went to a fête and I saw the same tank in model form made out of old World War I brass cartridges

melted down, and I found out it was made by a German prisoner of war. To prove that it was original, I have got the colonel's signature who captured the man, and a little note telling me of its history. I bought the tank for £1 and I had an offer of £15 for it the next day; I also had it valued for £15.

Alistair Beagley,
Truro, Cornwall.
RHINO CHARGE

In "Wheels and Wings and Things" (issue No. 50) you said that animals had become accustomed to the Whipsnade Railway. Well I went to Whipsnade in February and I travelled on the footplate of the engine. The engine driver was telling my brother and me how a rhino charged one of the locos and ripped a hole in the piston casing.
Tim Sizer,
Croydon, Surrey.

GRANDAD FAN

I was thrilled to read the "Steam & Power" article in the Christmas Special issue. My grandfather, now aged 85, was a traction engine driver from the time he left school at the age of 12 until the more modern tractors took over the work of these wonderful engines.

Grandad still retains his life-long interest in traction engines and last summer he returned to driving when he took a friend's Burrell working engine to two rallies in Scotland. He has also re-designed a model traction engine to be an exact replica of his own work engine, together with a model threshing mill.

I thoroughly enjoy *SPEED & POWER* each week, and, incidentally, so does my Grandfather.

Brian Fulton,
Arbrath, Scotland.

We always say that S&P is for boys aged from 8 to 80! —Ed.

THE UNITED STATES warship *Newport News* slows majestically as she nears the enemy coast. The navigator consults his charts and gives the Captain the position of the ship. The *Newport News* is now a hive of activity. The order is given to the Gunner Officer for the three gun turrets to train on the enemy positions ashore. Each turret has three 8 inch guns. The captain orders the ship to open fire and nine rapid-fire guns blast their shells to the shore, hitting enemy targets, and bathing the *Newport News* in flashes and smoke. Mission accomplished.

THE UNITED STATES warship *Newport News* slows majestically as she nears the enemy coast. The navigator consults his charts and gives the Captain the position of the ship. The *Newport News* is now a hive of activity. The order is given to the Gunner Officer for the three gun turrets to train on the enemy positions ashore. Each turret has three 8 inch guns. The captain orders the ship to open fire and nine rapid-fire guns blast their shells to the shore, hitting enemy targets, and bathing the *Newport News* in flashes and smoke. Mission accomplished.

CA148 HEAVY CRUISER aggressive role. As well as the nine 8 in. guns, she has 12 dual purpose 5 in. guns, four 3 in. guns, and two batteries of anti-missile rockets for her own defence against enemy aircraft. She is the only heavy cruiser in the NATO Fleet, along with the Spanish Navy's "Canarias".

The *Newport News* had two sister ships, the *USS Des Moines*, CA 134, and the *Salem*, CA 139, which have both been retired. She is now the permanent flagship of the American Second Fleet. Four Babcock and Wilcock boilers supply steam to a four-

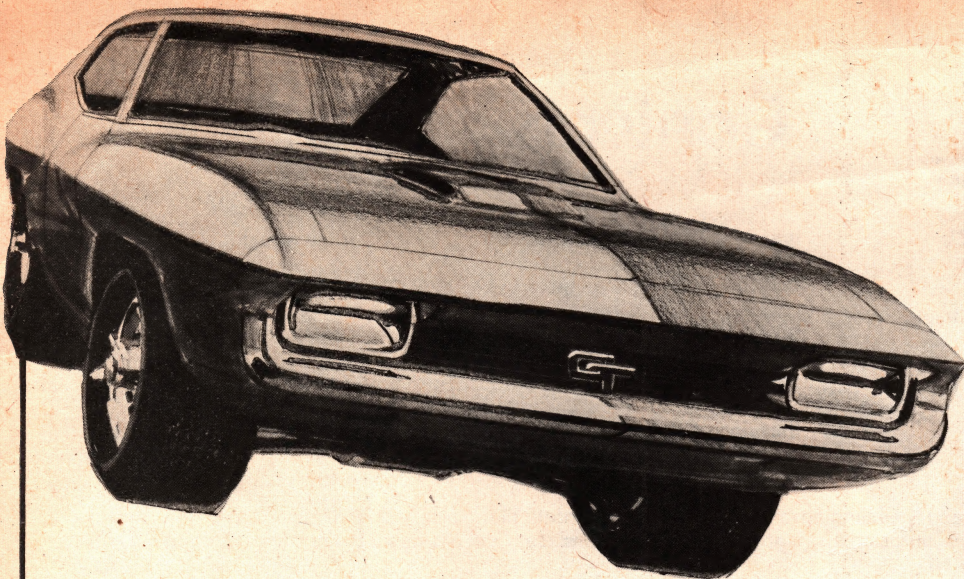
geared turbine driven propulsion system, thrusting the *Newport News* to a top speed of over 33 knots (more than 36 mph). The boilers develop 120,000 horsepower, plenty of power in reserve for electricity used in air conditioning, closed-circuit television, radio transmitting, printing and meat processing plant on board.

THE LAST

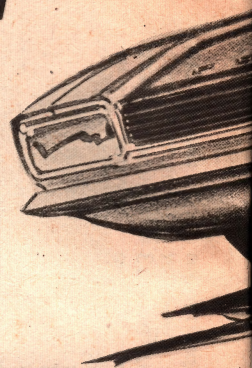
Newport News was launched on October 1, 1945, at the *Newport News Shipbuilding and Dry Docking Company's* Shipyard. She

was the last cruiser to be built by them, and bears the proud name of *Newport News* in honour of the city in which she was built.
FACTS AND FIGURES
Length 717ft. Beam, 76.3ft. Displacement, 17,000 tons standard, 21,000 full load. Armament, nine 8 in. guns (in three turrets); 12 5 in. dual purpose twin guns; four 3 in. guns, two batteries of anti-missile rockets. Main engines, four-gear turbines developing 120,000 shaft hp. Speed, 33 knots plus. Crew, 1,300 officers and men.

Photo: courtesy US Navy



Cars made from *Clay* and



COMPUTERS

EVERY motor car, whether a family runabout for the road or a contender in a Formula One Grand Prix race begins as an idea in some designer's head. Then come a few rough sketches.

If the motor company decides that the proposed car has possibilities, the go-ahead will be given for designing and building a prototype — a one-off test version.

Thereafter, as long as five years may pass and millions of pounds will be spent before the first of the new cars rolls off the production line. That is the reason why few cars of completely new design are built. The cost in time and money is so fantastically high.

DRAWINGS

Before a car of an entirely new design takes the road, draughtsmen will have produced between 15,000 and 20,000 separate drawings. They include plans of every single part of the car down to the smallest nut and bolt. Some of the plans will have been drawn and redrawn several times to include last-minute improvements.

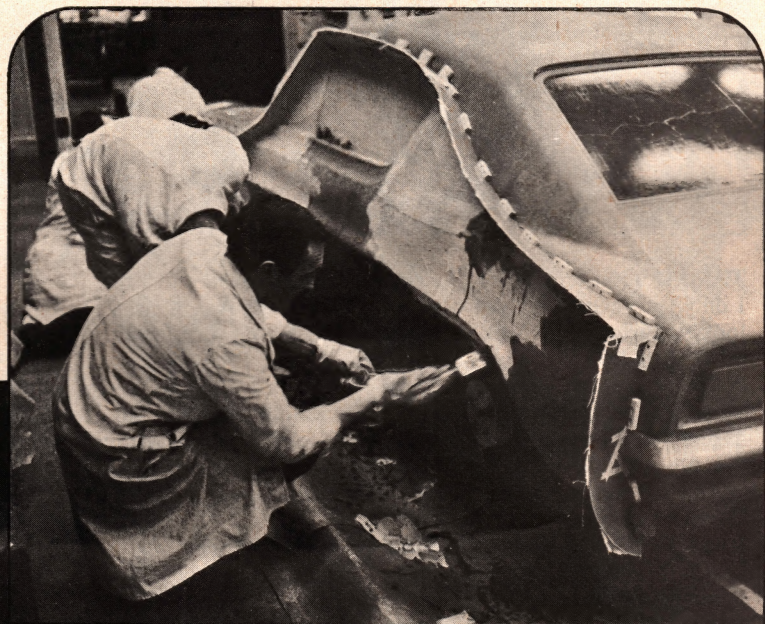
Using clay to decide the shape and computers to simulate months of road tests, a company can design a new car which they know will sell and go well long before the wheels of an actual production model touch the road!

Metallurgists conduct thousands of laboratory experiments to find out the best possible metals for the thousands of bits and pieces that go into a modern car. Other technicians test the plastics, rubber and other materials which will be used.

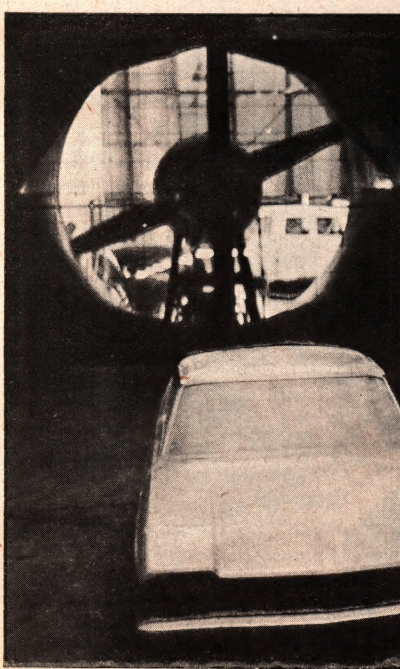
When the metals and other materials have finally been decided upon, the parts and components to be made from them will be tested until they break to establish just how they will behave in actual service.

Design and styling of the body is a vital factor in capturing a market for the new car. First of all a detailed drawing of the proposed car is prepared. The drawing is to strict scale and shows the basic body requirements of height, length and so on. Several of these scale drawings will be made to show possible variations of design.

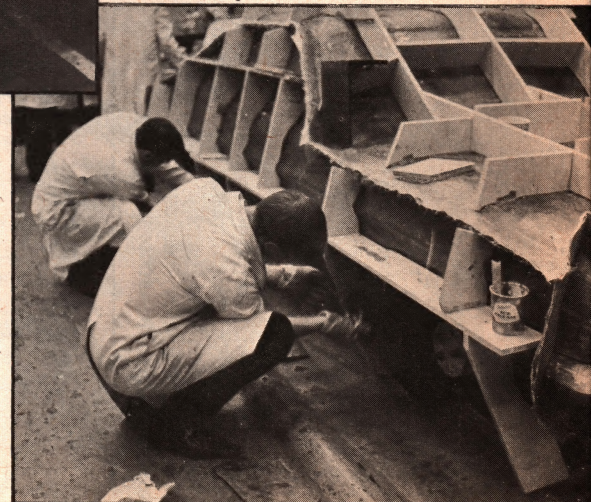
Eventually, one of the scale drawings will be accepted

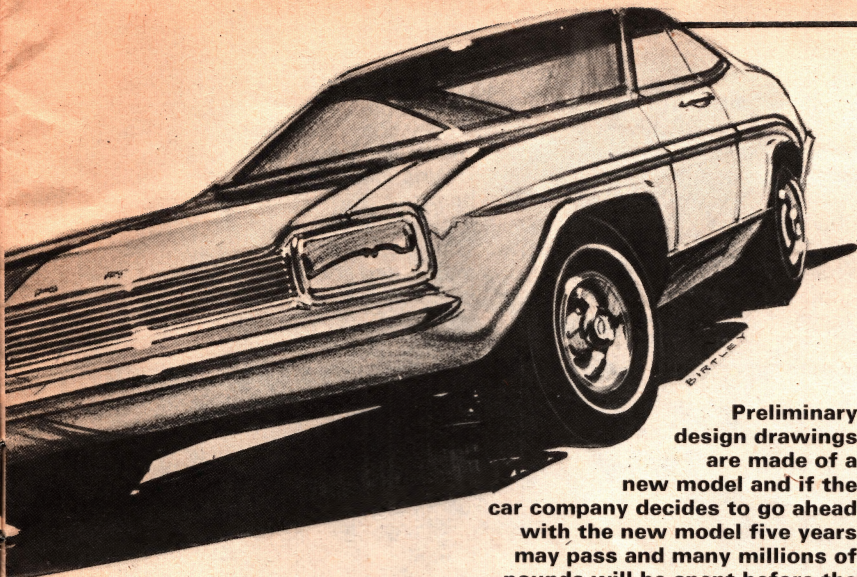


Left and below: Making a glass fibre mock-up from the clay model. Using this mould, the patterns for the full-size body will be made.



Setting up a scale model of a new car in the wind tunnel to make airflow tests. Sensors under the car or wool tufts stuck to the outside show how air flows over and under the model and what adjustments will have to be made to the shape to improve the aerodynamics.





Preliminary design drawings are made of a new model and if the car company decides to go ahead with the new model five years may pass and many millions of pounds will be spent before the first of the new cars roll off the production line.



Using clay to redesign the bonnet of an existing car and change the shape for a more-up-to-date version.

provisionally. But the company will want to see the car from different angles. So a scale model of the car will be made in clay. This will be remoulded scores of times to make adjustments and improvements in the general lines of the body.

Perfection of line having been at last achieved, the clay model will be fitted with wheels. Even the wheels will have been redesigned a number of times!

While the exterior of the body is being modelled and remodelled, other designers are working on the interior.

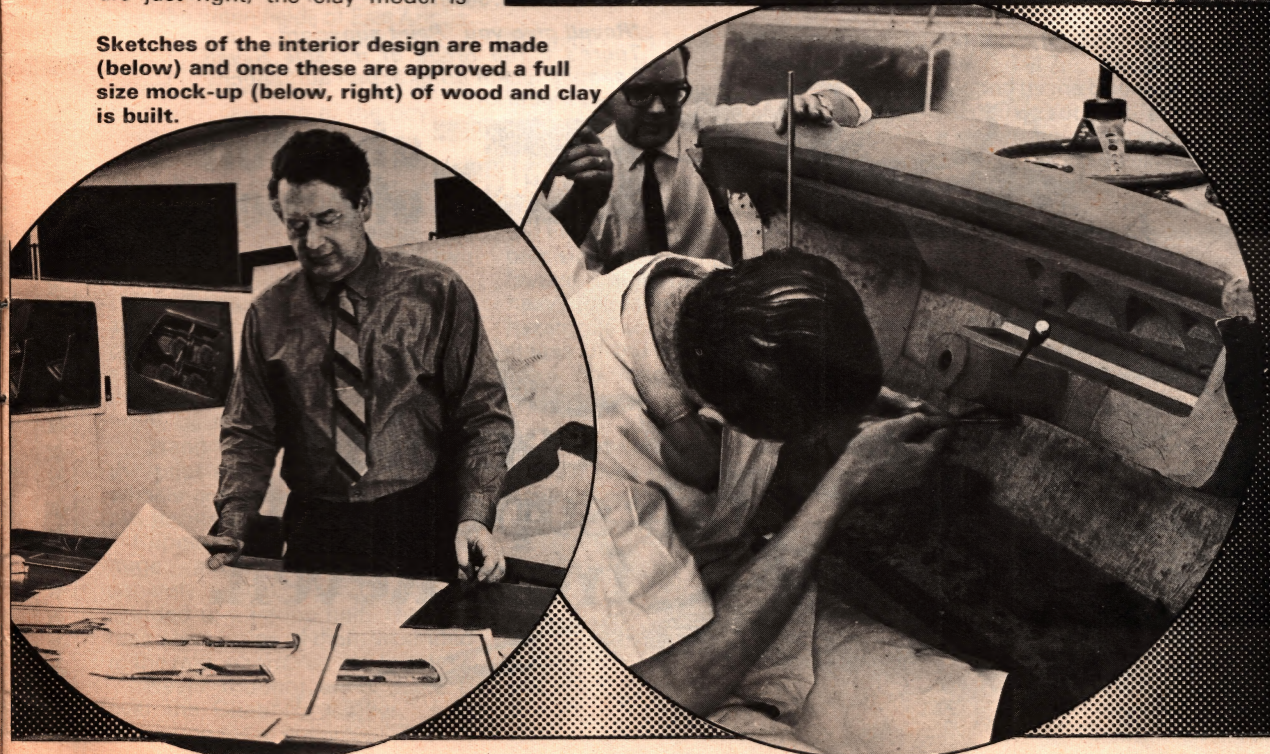
Various types of seats are tried out, and models of drivers and passengers with jointed limbs are used to find out the most comfortable positions for the occupants of the completed car. An important stage at this point is to ensure that the driver will be comfortable and able to reach the controls safely with feet and hands.

When everyone is satisfied that the exterior and interior of the body are just right, the clay model is



Even the design of new wheel rims has to go through the clay mock-up stage. Left: A dynamometer or "rolling road" being used to test the power output of a new car. This test rig can also be used for four-wheel drive cars.

Sketches of the interior design are made (below) and once these are approved a full size mock-up (below, right) of wood and clay is built.



duplicated in fibre-glass. This will be the pattern for the full-size body.

Next, a full-scale prototype of the proposed car is built and driven and tested in weather and road conditions. This gives the designers a mass of information about engine-performance, fuel consumption, road-holding, safe speeds and brake efficiency.

At one time prototype tests lasted for a couple of years before all the necessary information was obtained and analysed. Nowadays, however, a great deal of the time which would have been spent on road-testing a prototype can be saved by a computer. First developed and used by the Ford Motor Company, the computer provides in *hours* information which hitherto needed *months* of road tests. Indeed, much essential data is obtained from the computer even before a prototype is built.

By programming the computer with theoretical details of the proposed new car, designers get reliable estimates as to how the

CONTINUED ON NEXT PAGE

springing and suspension will cope with thousands of miles' driving over good and bad roads. Every component of the proposed car can be "road-tested" in the computer, which also indicates where improvements can be made before a prototype is built and tested on the road.

Closely linked with the computer is an electronic draughtsman called the "numerically controlled draughting machine". This can produce in just one hour scale drawings which otherwise would occupy draughtsmen for months.

The robot draughtsman is proving of immense assistance to the stylists who decide upon the

general lines of the proposed car. Having been programmed with the data for a basic design, the electronic draughtsman will draw a perspective sketch showing how the new car will look. Further programming enables variations in design to be seen visually.

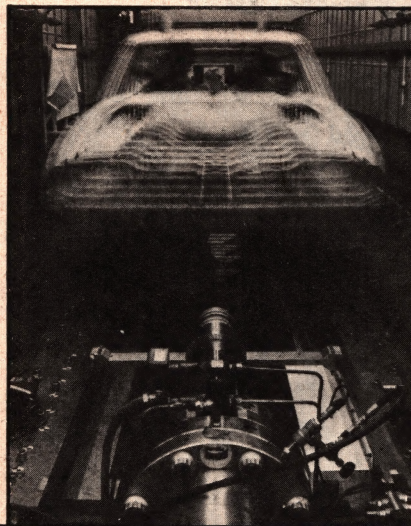
Some designers foresee the day when robot draughtsmen will be

electronically-linked with a modelling machine which will produce full-scale clay mock-ups of a proposed new car. At present making clay models and fibre-class mock-ups is an expensive and highly-skilled job that takes a long time.

Nonetheless, car designers and manufacturers are not yet inclined to leave design and testing entirely

with computers. Clay and other models are still made by hand, and prototypes continue to undergo strict road tests.

What the computer can do, however, is to cut out a great deal of routine tests and experiments. These consume a lot of time and money and add considerably to the cost of the car that eventually comes off the production line.



Left: Slow-motion impact rig to test the "crushability" of body panels. Above: The Cold Room where engine starting and heating systems undergo trials.



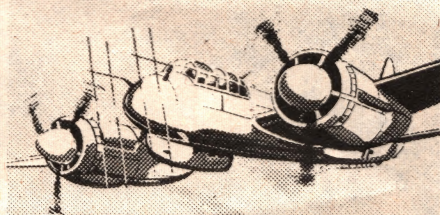
Spitfire Mark 2

Perhaps the best-loved fighter aircraft of all time, the Spitfire was the symbol of the R.A.F.'s victory in the Battle of Britain. Armed with eight Browning machine guns and Rolls-Royce Merlin powered, the sleek Spitfire was the one opponent the Luftwaffe feared. Revell's 1/72nd scale model kit captures all the fire and fury of this historic "air superiority" fighter. Add it to your collection soon! CAT. NO. H-611

Junkers - 88C "Nachtjager"

Air superiority counts at night too - and the conversion of the Junkers X88A bomber to the heavy night fighter role caused the R.A.F. to reevaluate their bombing tactics. Revell's 1/72nd scale "Nachtjager" is a faithful replica of the aircraft flown by the "Fighting Prince",

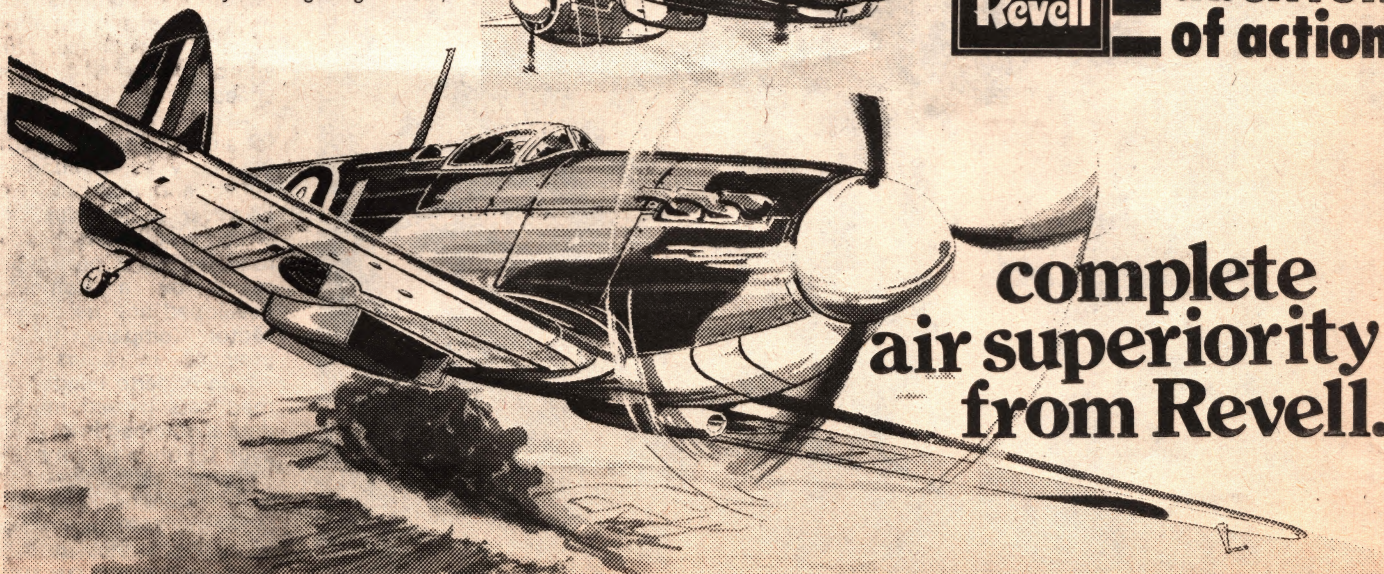
Major Prince Heinrich Zussayn - Wittgenstein, the Luftwaffe's top scoring night fighter pilot with 83 kills. On January 21st 1944, he downed four Lancasters in the space of forty minutes and was then shot down himself. His operator bailed out, but the "Fighting Prince" went down with the aircraft. Revell's kit includes cannon, machine guns, Junkers engine with removable display panel and S.M.2 radar aerial. CAT. NO. H-165



Revell's range of plastic model kits are designed for "detail superiority".* Ships, dragsters, spacecraft and commercial aircraft as well as war planes - over 270 kits in all, from 16p to £10.95. Packed with detail and so full of action. From the world's largest manufacturer of plastic model kits. Get the Big Revell Catalogue from your shop or send 30p to Revell (GB) Ltd., Cranborne Road, Potters Bar, Herts. Tel: 58261.

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Revell **a box full of action**



**complete
air superiority
from Revell.**

Flying FORTRESS AT WAR

INTO THE JAWS OF DEATH

*"Me 109 at six o'clock—watch him, waist gunners" . . .
"Four coming in dead ahead" . . . "B-17 going down on
the left" . . . "Steady, steady—bombs away . . . Let's
get outa here!" The Flying Fortress flicks up as the
bombs fall away and the formation turns for home.*

HAVING struggled over the English Channel, losing altitude all the way, the shattered Boeing B-17 of the American 8th Air Force flew slowly over the green fields of East Anglia.

A gang of village schoolboys stared up as the damaged bomber swept low overhead. "It's a Flying Fortress," said one of the boys. "I think it's going to crash!"

The B-17, returning from a daylight raid over Germany, was a flying wreck. Its big rudder had been shot away, its fuselage was punched full of holes, and only two of its four engines were working.

The Fortress was noted for its ability to absorb incredible punishment and still keep flying, on a "wing and a prayer". But this time the battered "Fort" did not reach its home base . . .

"Stand by for a rough landing," the pilot warned his crew. "The wheels are jammed. I'm going to put her down on her belly!"

Clipping the top of trees, the huge aircraft flopped down squarely in a ploughed field and skidded to a jarring halt. The ten-man crew, some of them wounded in the raid, scrambled out to safety.

"Never thought we'd make it over the Channel, skipper," said the young radio operator. "Thanks

for getting us back." The veteran pilot gave a wry grin. "Don't thank me, kid," he replied. "Just thank your lucky stars you were riding a B-17, a plane with a whole lot of fighting guts!"

The B-17 certainly won its fame the hard way. The brave crews of the Flying Forts pioneered daylight precision bombing (the RAF favoured night raids) and suffered heavy losses in carrying out these hazardous sorties. For, in the early stages of the daylight raids, there were no long-range fighters to

escort them to their targets.

The B-17, designed and developed by the Boeing Company of Seattle, was originally thought of as a defensive weapon, the aerial counterpart of an artillery battery, to guard the coasts of America against an enemy fleet. And from this intended role came the legendary name "Flying Fortress".

FIRST—AND FAST!

The prototype B-17 made its first flight in July 1935. It was a

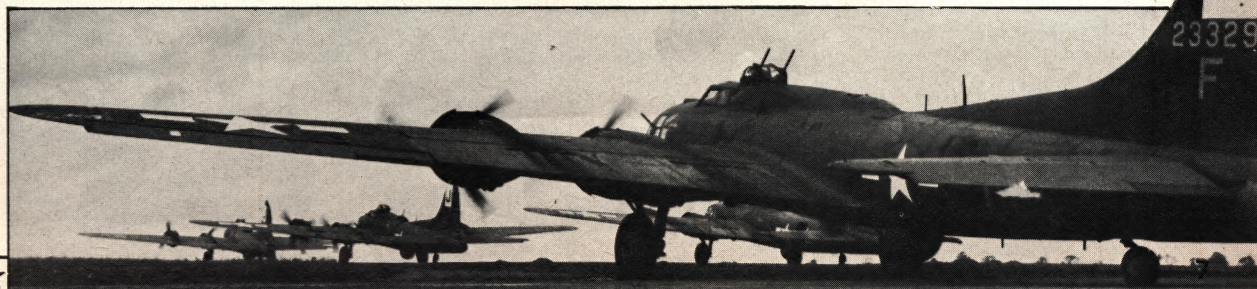
revolutionary aircraft—the first all-metal, four-engined monoplane bomber, and faster than the best American fighters of the day. The original B-17 was improved and in March 1941 large numbers of the B-17C model were delivered to the RAF in Britain. They lacked the long dorsal fin of the later models which was their main recognition feature.

Because of various mechanical problems and "teething troubles", the B-17C was not a success with RAF Bomber Command, although the British were impressed by the plane's high altitude performance and structural toughness. The B-17s were used primarily by RAF Coastal Command.

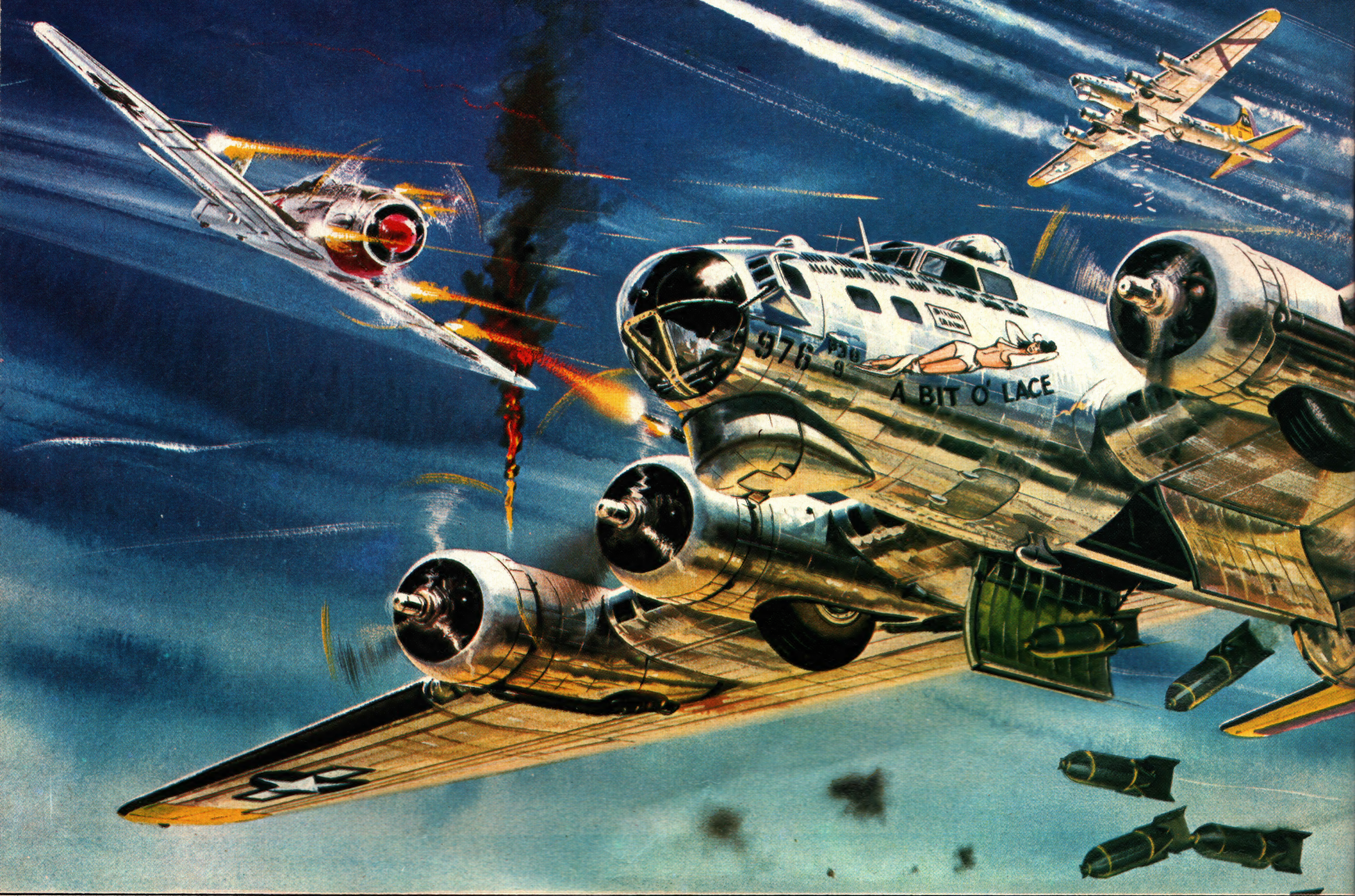
Learning from the combat experience of the RAF, Boeing rectified the problems, and the improved B-17E, quickly followed by the B-17F, was put into mass production. Then in July 1943 came the last of the Flying Fortress

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Top: Last version of the Fortress line was the B-17G. The most noticeable difference from the early models was the two-gun "chin" turret under the nose. Below: Framlingham echoes to the roar of engines as the 390th Bomb Group heads out for another mission.



Bombs away! With German fighters doing their best to stop it, a 447th Bomb Group B-17G releases its load of 500lb high explosive bombs. This beautiful painting is reproduced by kind permission of Airfix.



line, the heavily-armed B-17G.

A few months after the United States entered the war in December 1941, the Americans began to establish their mighty 8th Air Force in Britain, and the first high-level daylight bombing raids on Occupied Europe were mounted in August 1942. By 1944, hundreds of B-17s were taking off nearly every day to blast German military targets.

The Americans favoured daylight bombing because the Flying Fortress could operate at very high altitudes (over 20,000 feet), above the accurate range of anti-aircraft guns, and they had the Norden bombsight which could place bombs with pinpoint precision in clear daylight.

But the Americans had reckoned without the high-flying ferocity of the German fighters. To combat these interceptors, the heavily-armed Fortresses flew in close

"box" formations so that their combined firepower gave the German fighters a hot reception.

Despite its huge size, the Flying Fortress was cramped and sometimes uncomfortable for its ten-man crew. Owing to the intense cold at high altitudes, all the crew wore electrically heated flying suits.

LONELY CAGE

Perhaps the worst position was in the tail turret, a tiny and lonely Perspex cage. The tail gunner received all the icy draught that blasted in from the large open side ports of the waist gunners; this discomfort was reduced in the B-17G which had its waist windows glazed. Another unenviable position was the belly or "ball" turret, called the "morgue" because of its vulnerability to gunfire!

The Fortress was a good plane to

fly. Docile, easy to handle, predictable, and trustworthy. But it had its faults. While it could endure an amazing amount of damage and keep flying, it had a nasty tendency to catch fire. And it was weak when subjected to frontal attack by fighters; not from lack of guns, but from lack of armour plate protection for the crew.

Early in 1944, the Americans stopped using camouflage on their combat aircraft and "silver" B17Gs began to appear in all-metal finish. The Flying Fortresses were also noted for their "nose art"—emblems, figures, and nick-names painted on by the crew. "Pistol Packin' Mama", "Lady Luck", "Memphis Belle", "Southern Comfort", "Bat Outa Hell", and "Berlin Sleeper" were some of the names and figures that adorned these big bombers.

In the summer of 1944, five B17Gs were converted into "flying

bombs" for the top-secret "Aphrodite" project. Packed with ten tons of high explosive, the doomed Fortress would be taken to a certain height and put on course by a two-man crew, who would then pass over control to a following "mother ship" and bail out.

The flying bomb Fortress, now under remote radio control, would be directed and dived by the mother ship into a special target on enemy territory. It seemed a good idea at the time but it did not prove successful and the project was abandoned.

100 SHOT DOWN

The many battle honours of the B-17s include the "into the jaws of death" daylight raids on the heavily defended German ball-bearing and aircraft factories at Schweinfurt and Regensburg where, in August 1943, the gallant 8th Air Force lost





100 Fortresses in a single week. And on one day alone, over Schweinfurt in October 1943, 60 Forts were shot down by flak and fighters!

In spite of these terrible losses, the B-17s never turned back before completing a mission. With the coming of the long-range P-51 Mustang fighter, which could escort the bombers all the way to the target and back, the Fortresses had an easier time.

FEW LEFT

Of the 13,000 B-17s that were built, only a few survive today. Most were broken up for scrap after the war and others were used as targets in missile development. Some were modified by the US Navy for sea-search and anti-submarine work, and some were sold to foreign air forces. Others were converted to private and airline use.

Over the years, the Flying Fortress has become quite a film and TV star. Films such as "12 O'Clock High", "The War Lover" and "The 1,000 Plane Raid" have shown the B-17 in dramatic wartime action—look out for them on television the next time they come round.

Today the Flying Fortress is a rare bird indeed. A few grounded ones are on display at museums, and even fewer are in flying condition. One that was rescued from the scrap yard and restored to its former glory is flown regularly at air shows by The Confederate Air Force, an aircraft preservation society in Texas.

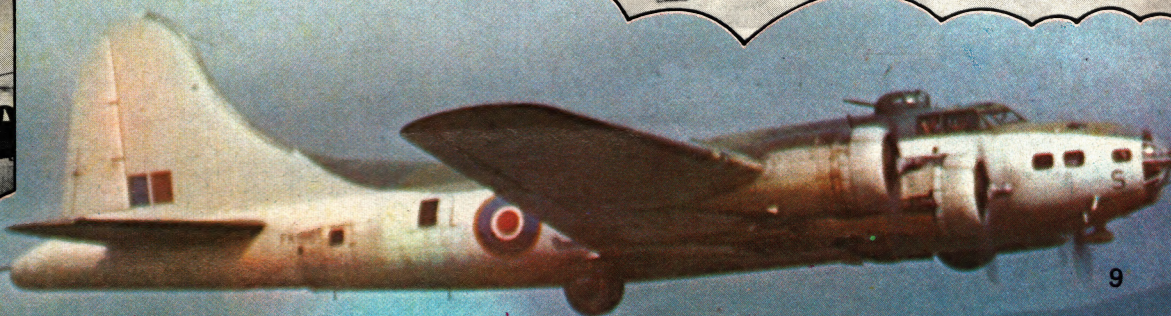
Photos: courtesy Imperial War Museum



Left: A big formation of heavies could deliver a terrible rain of bombs. Many German targets were knocked out by American precision attacks. Here, B-17Gs of the 91st Bomb Group "let 'em go".

Right: A "train" of fire bombs caught in mid-air as they tumble from the belly of a 390th BG B-17F.

Below: Heading out across the Atlantic on an anti-U boat patrol is an RAF Coastal Command Fortress Mk II.



1000MPH MAG



The Opel on the RAC International Rally of Great Britain. The car came to a halt in a cloud of white steam after the radiator broke loose and was damaged by the engine fan.

When Mick Robertson, presenter of the *Magpie* television programme, decided to go rallying, it was David Hardcastle, Rally Editor of *Motor* magazine who took him under his wing! Here David tells you what happened to Mick the "Flying Magpie" on his rally debut . . .

FOR MOST car fanatics, winning their first-ever race at the famous Brands Hatch track in Kent would be the most exciting moment of their lives—especially if it all happened in front of seven million TV viewers!

But for Mick Robertson, the pop-singing presenter of Thames Television's programme "Magpie" every Tuesday and Friday, it just didn't compare with the battle to keep a fast-moving rally car on a narrow, slippery special

stage deep in the countryside.

Mick's track-racing debut was a sparkling success but he was anxious to see what it was like on the other side of the motor sporting fence – rallying, in which drivers and their navigators go flat out against the clock over winding forest roads on which they are not allowed to practise. So last summer, he teamed up with *Motor* magazine rally editor, David Hardcastle, who was already competing in national rallies, using an Opel Ascona 1.9-litre saloon.

CONFIDENCE

The car, prepared to Group 1 specification (the class for mechanically standard cars) by McGill Automotive of St. Albans, seemed to

give Mick immediate confidence – in spite of the fact that his daily transport consists of a large and stately Alvis automatic tourer!

"I felt that rallying was probably more testing for a driver than racing, because of all the differing surfaces you use. The tracks can change from tarmac to gravel or mud all in the same stage," explained Mick. "It's more challenging – even if it's not quite as glamorous."

Thames TV's camera crews travelled to the beautiful Cirencester Park to follow Mick and David on their first event together, the Arkell Trophy. This rally consisted of several special stages through the picturesque parkland, but the 150 cars also had to travel out along nearby public roads (observing the speed limits) to

PIE!

stages on nearby farm roads and a small airfield.

It was the airfield – where cars had to complete two laps of the perimeter track at speeds up to 100mph – which gave Mick his only frightening moment of the event. On a long left hand bend which tightened considerably, the Opel started to slide wide and went into a vicious spin which took it off the concrete track and down a steep grass bank!

"As we came to a stop I remember thinking how convenient it was that we hadn't knocked over any of the plastic marker cones at the edge of the track," said Mick. "Then, as I drove up the bank back onto the stage I noticed they were all concrete – we'd missed a terrible smash by only a few inches!"

RALLY PRESSURES

In spite of the dual pressures of his first rally AND television work throughout, Mick drove coolly with care for the rest of the day, eventually being placed about half way up the field in a rally notable for its lack of retirements. The strain had to show somewhere, however, and when the camera and microphone closed up on the car only minutes after it crossed the finishing line, the exhausted pilot was too tired to complete even one sentence to sum it all up!

Since then, TV work and Mick's new love – recording songs which he has written himself – has limited the time he can devote to rallying. Thus on the RAC International Rally of Great Britain sponsored by Lombard late last November, he dropped the flag to start the Magpie car crewed by David Hardcastle and Tony McMahon.

As the Opel rolled off the ramp in York, it had 2000 miles, 4½ days and two through-nights of hard work ahead of it on rough forestry stages in England, Wales and Scotland. The weather was the worst for many years and drivers had to tackle flat-out stages in driving rain, thick fog, over snow and ice – and in blinding sunshine.

SNOW-BOUND

The retirement rate was high and by Tuesday afternoon, when David rang the Magpie studios from a snow-bound call box near Carlisle, the car had reached 42nd overall out of the 200 starters, and was 4th in its class.

But the Magpie good luck spell, which earlier in the season helped them to 11th overall in an International rally in Belgium (the crew's first overseas rally), suddenly wore off. Said David: "Only half an hour after the programme went off the air, we were stopped at the side of the road with a smashed radiator and no time to get it repaired before we were excluded." The car had not gone off the road or hit anything hard – just "yumped" viciously at the end of a stage, dislocating the radiator mountings and allowing the fan to penetrate the core.

"I peered at the road through a cloud of white



Above: David Hardcastle at speed in the Opel Ascona, the car in which Mick Robertson had his first taste of high-speed rallying. Below: In the Magpie studio Mick and David pose beside the Ford Capri they hope to rally this year. In front are a host of rally "goodies".



steam and realised we weren't going to make it," said David sadly.

Although "Magpie" has now left your screens for the half-summer break (it returns in late July) the rally team has certainly no time for a holiday.

NEW CAR

In mid-March, David and Mick introduced viewers to the 1975 team car, a brand new yellow Ford Capri 3000 GT which had just been driven out of the showroom. The "Magpie" studio was filled with rallying equipment which was to be fitted to the car – full harness seat belts, a roll-over cage to protect the occupants' heads in case of a big accident, fire extinguishers, sumpguard and a host of other goodies.

As soon as the programme ended, the car was

immediately whisked back to Ford's competition department at Boreham, Essex, for full preparation to Group 1 specification (no engine tuning, remember!). The Boreham mechanics are too busy looking after the new Escorts of works drivers Timo Makinen and Roger Clark to look after the Capri during the season so it's going to be based at the Bradford branch of the C. D. Bramall Group, main Ford dealers.

After the last TV appearance of the old programme series, in which Mick drove the Capri in a Hertfordshire autocross organised by Chess Valley Motor Club, the car was scheduled for a number of rallies in various parts of the country with Mick or David Hardcastle at the wheel. Look in when "Magpie" comes back on the air to see who has won what – or who has had to straighten dents in the bodywork!

SLEEPING AT SPEED

...on famous night expresses

THE HOURS between 2am and dawn are the worst for the train driver. Any railwayman will tell you that there is a deathly calm in the air; a chill that seems to penetrate to your bones. You have to be constantly alert when you're powering a train at a mile-a-minute through the night, but these are the hours when you feel least alert. So drivers fight the loneliness of the late shift by chewing gum or smoking cigarettes.

No matter what, the trains have to keep rolling through the night. When ordinary passenger services have finished, and while the world sleeps, the "nocturnal" trains start their journeys. There are the newspaper and mail trains, rushing through the night so that papers can reach remote areas by breakfast time; the long-distance overnight freights which don't have to be held up to let passenger trains past; and there are the sleeper expresses.

These are the trains that leave the main termini between about midnight and 1am, speeding through the inky black countryside to reach far-away destinations in the early morning, while their passengers sleep. The coaches are fitted with all mod-cons—automatic ventilation, heating and hot water and luxurious bedding. There is even a "room service" of light refreshments and drinks provided by smartly-uniformed attendants who have their own compartment in each coach.

IN THE CAB

Up in the cab of the diesel or electric locomotive, things aren't quite as luxurious. Though the cab is heated and the driver sometimes has facilities for brewing up a cup of tea on a "hot plate", he gets a bumpy ride in the cab, and has to concentrate on the colour light signals which send powerful beams into the night.

Sleeper trains are limited to slower speeds than the daytime expresses, normally 70mph, so that slumbering passengers get "as smooth a ride as possible. Night drivers also tend to "go easy on the brakes" and don't sound their horns except in an emergency so as not to annoy residents along the line.

FIRST SLEEPERS

Sleeping cars were first used in Britain over one hundred years ago, in 1873. This was on the North British Railway between Glasgow, Edinburgh and London King's Cross. People took some time to get used to the idea of going to bed on a train, and the North British sleeper often ran empty.

In 1881 the Great Western Railway introduced a comfortable sleeper with six double-berth compartments, three toilets and an attendant's pantry. By 1914 sleeper services were well established on many main lines, and most had the luxuries of hot water, electric lighting and refreshments. Four-

teen years later, sleepers were made available to third class travellers, and the idea of "sleeping the night and gaining a day" really caught on.

In October 1936, the Southern Railway introduced the train that was to become Britain's most famous night express—the *Night Ferry*. This ran between London Victoria and Paris, the train being shunted on to a ferry at Dover, Kent, and unloaded at Dunkirk, France, for the rest of the rail journey. The rolling stock used on this trip was the luxurious continental *Wagons Lits* sleeping cars, similar to British "Pullmans". After a break caused by World War II, the *Night Ferry* has continued its cross-channel journey right up to today.

STEAMER

On other lines, such as the LMS in steam days, a famous locomotive like a *Coronation* would be seen throwing sparks into the night, its firebox glowing, as it pounded the Glasgow Sleeper northwards.

Today, electrics have taken over on this route, and sparks come from the high-voltage overhead wires rather than red-hot cinders as the sleepers head through the night.





Left: "Morning tea is served"! A modern first class sleeper berth. About 900,000 people a year use British Rail Sleeper trains, which serve 100 different towns and cities.



Above: 2,700 horse-power diesel *Western Vanguard* at London's Paddington station, ready to depart with a sleeper train for Devon.



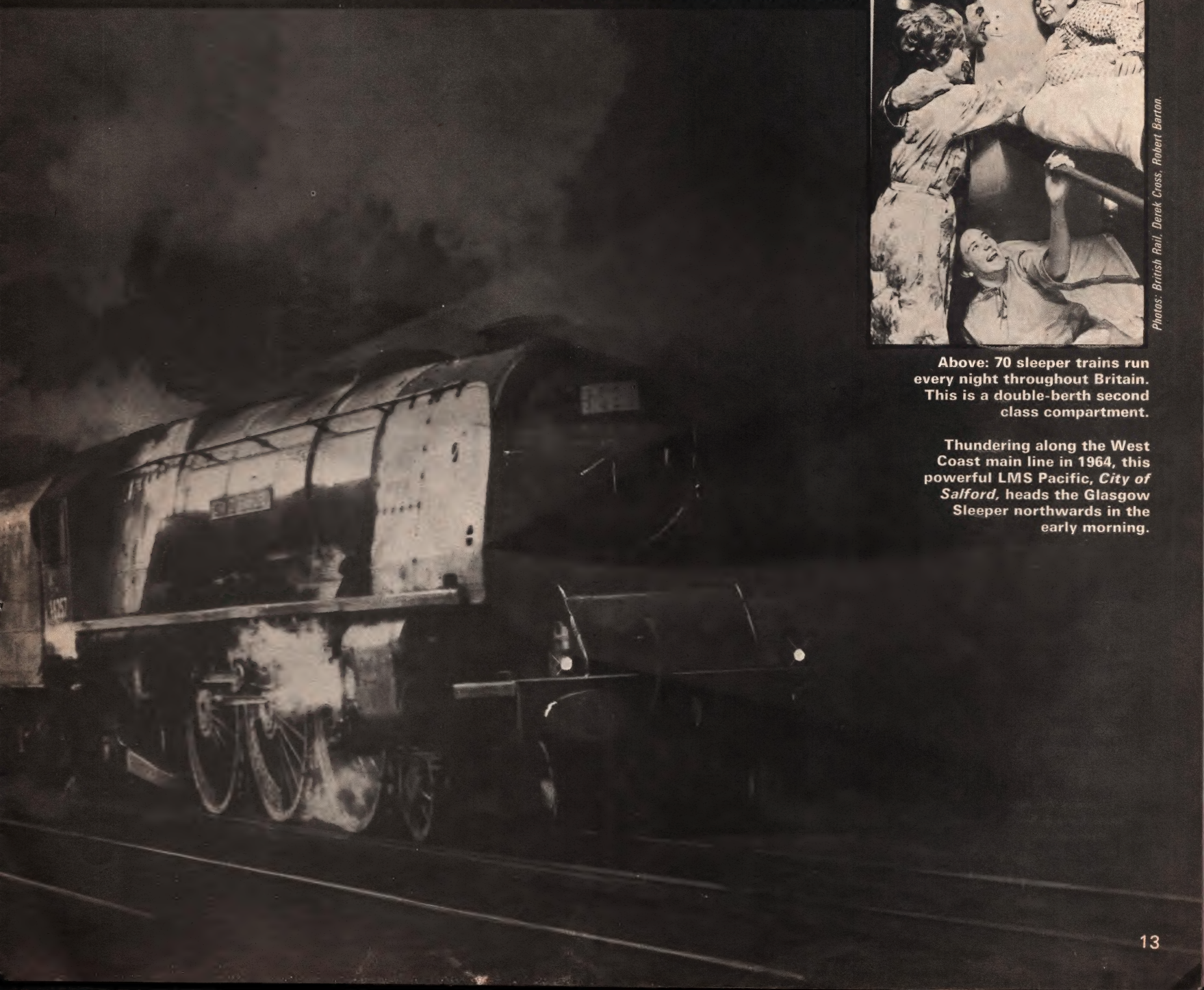
Above: The famous *Night Ferry* express travels from London to Paris every night, via a cross-channel train ferry.



Photos: British Rail, Derek Cross, Robert Barton.

Above: 70 sleeper trains run every night throughout Britain. This is a double-berth second class compartment.

Thundering along the West Coast main line in 1964, this powerful LMS Pacific, *City of Salford*, heads the Glasgow Sleeper northwards in the early morning.



Slowest Race of the Year?

Whoever heard of a boat race in which you mustn't go too fast and you have to carry your boat on your back some of the way? Well, a race like that is "run" every year in London . . .

DUCKING LOW to get out of the freezing damp wind, wincing at the ear-splitting howl of the straining outboard motor, glancing anxiously behind at other competitors, the power-boat driver lays on full power and his craft cuts through the choppy water—at all of 8mph!

The boat is competing in what must be one of the oddest races ever in which contestants are actually *forbidden* to travel at more than 4mph over some stretches!

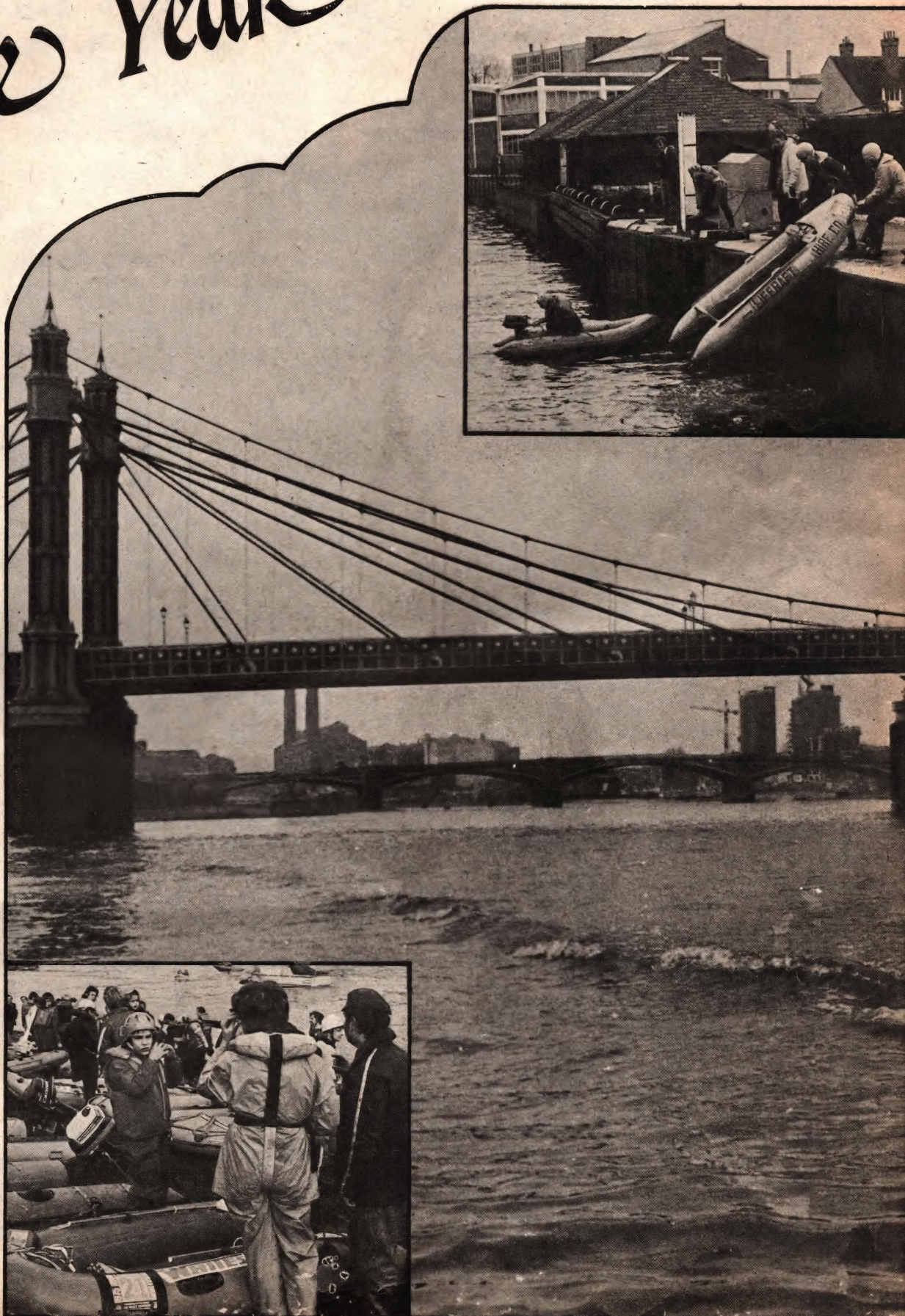
This "race with a difference" is the annual event for small inflatable dinghies organised by the London Motor Boat Racing Club in conjunction with the Boat Show.

It all started in 1973. The idea was a test of stamina more than anything else, as the race is held in January, using stretches of the River Thames and London canals, over a 40-mile course.

The race is open to anyone with a rubber boat powered by an outboard motor and it helps if the crews are fit—the boats have to be carried quite a bit during the race! This is because the course takes in a number of locks on the Grand Union Canal and to wait for them all to fill with water would take far too long. So each boat is fitted with ropes to haul it along on dry land over these sections.

This year, no less than 75 boats started the race at Putney on the Thames. Boats had to be standard production models with a maximum length of 12 feet. Engines range from hand-start to highly developed multi-cylinder out-

There's no age limit to the race but it's a gruelling event. It was even more amazing, then, that 14-year-old Junior Boat Racing Champion Kevin Kay (adjusting his helmet) managed to finish the course



ON THE night of September 3, 1916, Lieutenant William Leefe Robinson, flying a B.E.2c biplane, was returning from an unsuccessful search for one of the German airships that had been raiding England almost unchallenged for the past two years. Suddenly, his disappointment turned to excitement. There, caught in the beams of several searchlights, was another airship!

Putting his aircraft into a dive, Robinson descended from 13,000ft. to 8,000ft. and raked the craft from stem to stern with his machine gun. It had no effect!

Drawing to within 500ft. behind the raider, he then fired the contents of a whole ammunition drum into one area. The airship began to glow and, as the hydrogen inside its gas bags ignited, the rear of the craft burst into flames and it fell out of the sky, crashing down on Cuffley, Hertfordshire, where it burned for two hours.

It was a great triumph for Robinson. He had shown the people of Britain that the "Zeppelin menace" was coming to an end. However, Robinson had not shot down a Zeppelin. He *had* shot down a German airship, but it was one built of wood by the Schütte-Lanz Company. At that time, however, every rigid airship—that is, one having its gas bags enclosed in a rigid framework covered by fabric—was described as a "Zeppelin", after the famous German Count Ferdinand von Zeppelin who had first perfected them.

Count Zeppelin's first airship made its maiden flight from Lake Constance, Germany, on July 2, 1900, when the Count was 62 years old. It was a massive 420ft. long and powered by two Daimler 14hp engines driving four propellers. On July 1, 1908, his fourth airship, LZ4, made a sensational 12-hour flight over the Swiss Alps. By the end of 1909 the Germany Army had two Zeppelins, and the Count's company was truly in business.

Late in 1909 the German Airship Transport Company, known as DELAG, was formed, and by the time war broke out in 1914 the company's

Right: The airship genius, Count Zeppelin, fathered many successful designs, including the LZ4, which made a dramatic flight over the French Alps in July, 1908.

airships had carried out many commercial flights. Three of them, the *Viktoria Luise*, *Hansa* and *Sachsen* had each flown between 1,000 and 1,500 hours, covering a total of 90,000 miles and carrying 37,250 passengers.

Up to this time, Britain and France had been rather less successful. Not surprisingly, both countries' airships bore strong similarity to the Zeppelin designs. Britain's first rigid airship was built at Barrow by the Vickers Company in 1911. Officially named Vickers No. 1, it became better known by its nickname—Mayfly. Unfortunately, it didn't!

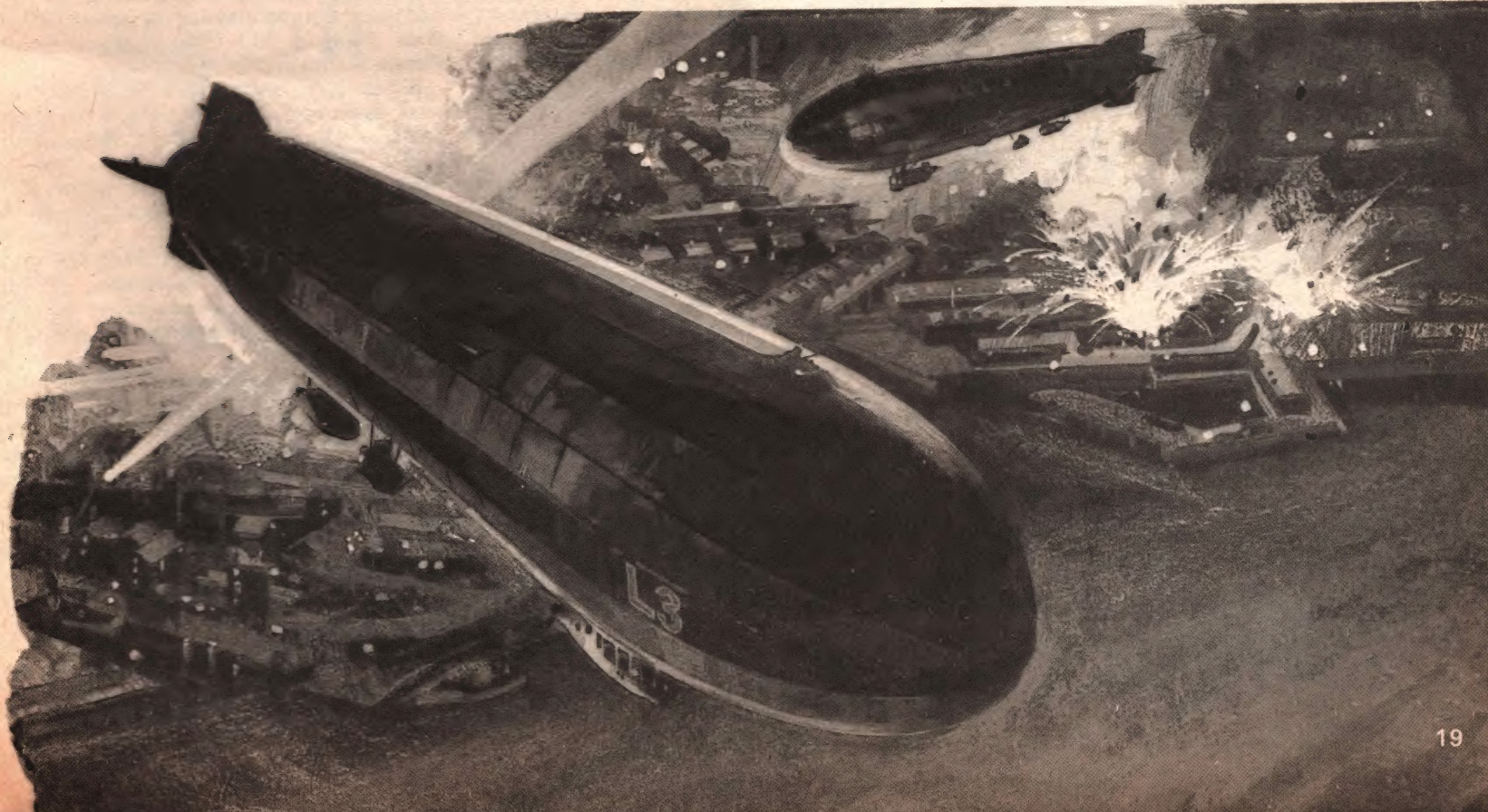
Mayfly made her first public appearance on May 22, 1911, but was so overweight that drastic alterations were necessary. When she reappeared on September 24 her hull collapsed while coming out of the hangar, and that was that!

The French airship, designed by Joseph Speiss and built by the Société Zodiac, was begun in 1909, but did not fly until April 17, 1913, when it was completely out of date. The Speiss was greatly enlarged in May 1913, and continued in service until the outbreak of World War I.

When the war began, therefore, Germany was years ahead in airship development, and the Zeppelin Company had already produced 29 airships. The German Army had seven Zeppelins, the Germany Navy one, and the commercial Zeppelins were also converted to

CONTINUED ON NEXT PAGE

Right: Suspended in flimsy metal gondolas, German airship crews would have liked more comfort! At times they spent 1½ days in the air, freezing in temperatures as low as 36 below zero. Below: The first Zeppelin raid on England was in January 1915, when two struck towns in East Anglia.





carry out reconnaissance flights and bombing raids. On the night of January 19-20, 1915, the Zeppelins L.3 and L.4 brought the war to England when they attacked Yarmouth, Cromer, Sheringham and King's Lynn. The life of Zeppelin crews, however, was not very glamorous, and they had to tolerate as much as 36 hours in the air, often in temperatures as low as 36 degrees below zero!

At first, the airships' rapid climb rate and ability to operate at high altitudes made them hard for aeroplanes to catch but, on June 7, 1915, Flt Sub-Lt R. A. J. Warneford, flying a Morane monoplane and armed with a rifle and six small bombs, intercepted the Zeppelin LZ37 over Gontrode, near Ghent, as it descended to land.

BOMBS AWAY!

Finding his rifle useless, Warneford flew above LZ37 and dropped his bombs. The giant airship crashed to the ground in flames, and Warneford's aeroplane was thrown about by the explosions. His engine stopped and he was forced to land in enemy territory, but he succeeded in starting up again and flying off amid a hail of bullets from enemy soldiers who had just arrived on the scene! Warneford was the first pilot to bring down a Zeppelin, and received the Victoria Cross for his deed.

One Zeppelin, the L59, made a remarkable flight to Africa during the war, to relieve heavily outnumbered German troops. Although the attempt was abandoned, the airship covered

Zeppelins certainly got around. One, L59, took four days to fly 4,230 miles to Africa in an unsuccessful attempt to relieve German troops during World War I.

4,230 miles, remaining airborne for 95 hours!

The Zeppelin threat was now mastered, but raids on Britain and other countries continued until August 1918, and they kept half a million troops in Britain on defence duties. Zeppelins of the German Navy kept a watch on the British Grand Fleet, and harried or attacked our submarines. When the war ended, 93 Zeppelins had been built and they had carried out 310 air raids, dropping 143 tons of explosives on Russia, France and England.

British rigid airships built during World War I were based on Zeppelins which had been captured or shot down. The first of these, the No. 9, was ordered in 1913 and finally flew on November 27, 1916, by which time it was well out of date! No. 9 was only used for training flights, being broken up in 1918. Late in 1915 four new airships, R23, R24, R25 and R26, were ordered. These were completed in late 1917/early 1918 and, once again, were well behind German developments. They were all scrapped in 1919.

Two airships of improved design were flown before the war ended, one of them, R29, taking part in a successful attack on the German U-boat U.B.115 on September 29, 1918. Only one other British rigid, R31, was completed and flown before the armistice, although others developed during the war were to fly later. It was very clear in 1918 that Germany was years ahead in rigid airship design, but with the return of peace, greater achievements loomed in the future.


NEXT WEEK:

Success and failure. Some epic airship flights and terrible disasters after World War I.


Britain lagged behind Germany in airship design during WWI, but R29 was an improved craft that helped capture a U-boat in 1918.

SOS INTERNATIONAL

The DEATH OF A TANKER



AN ABANDONED GAS TANKER IS DRIFTING TOWARDS THE HEAVILY-POPULATED ISLAND OF KILDA IN THE CARIBBEAN. SOS INTERNATIONAL HAS BEEN CALLED IN TO AVERT A DISASTER, BUT AFTER AN OFFSHORE ROCK HAS BEEN BLASTED OUT OF THE SHIP'S PATH BY AERIAL BOMBARDMENT, A NEW DANGER THREATENS.



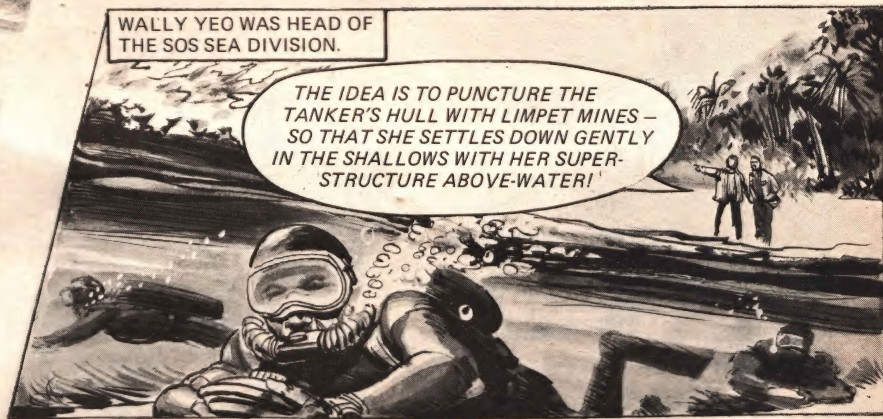
WHEN THE TANKER BEACHES, CHIEF, HER TANKS COULD FRACTURE AND RELEASE THAT KILLER-GAS SHE'S CARRYING!

SO YOU FROGMEN ARE HERE TO STOP HER BEACHING...


OLIVER FREY



WALLY YEO WAS HEAD OF THE SOS SEA DIVISION.

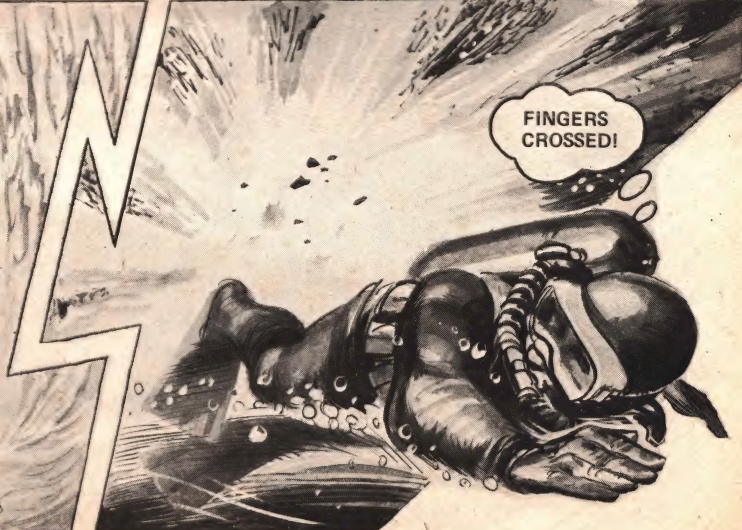


THE IDEA IS TO PUNCTURE THE TANKER'S HULL WITH LIMPET MINES - SO THAT SHE SETTLES DOWN GENTLY IN THE SHALLOWS WITH HER SUPER-STRUCTURE ABOVE-WATER!



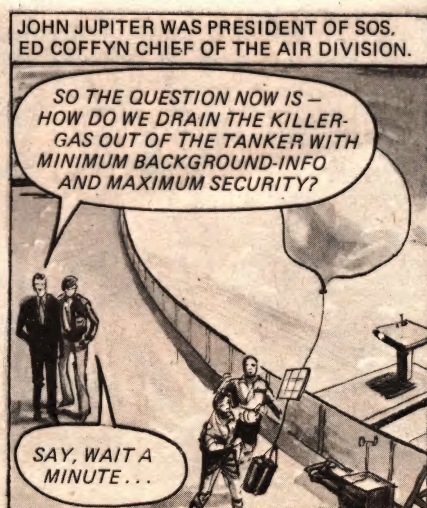
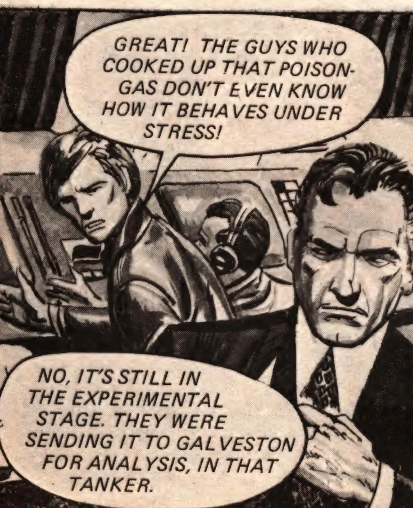
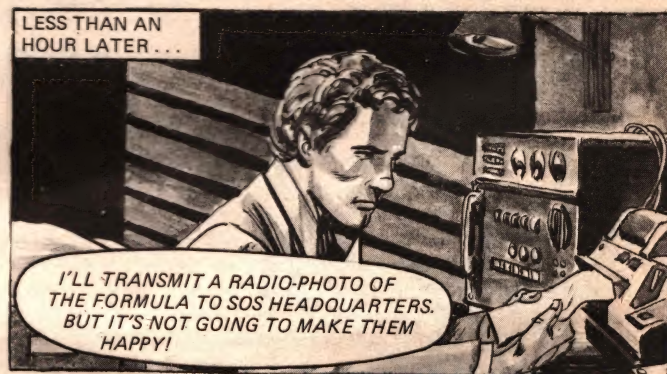
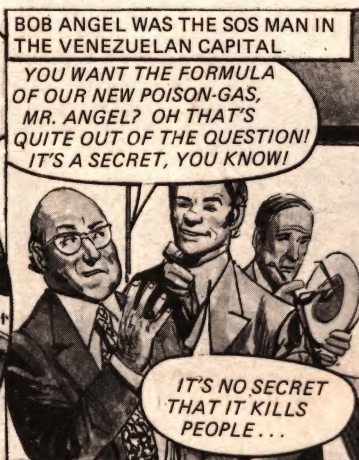
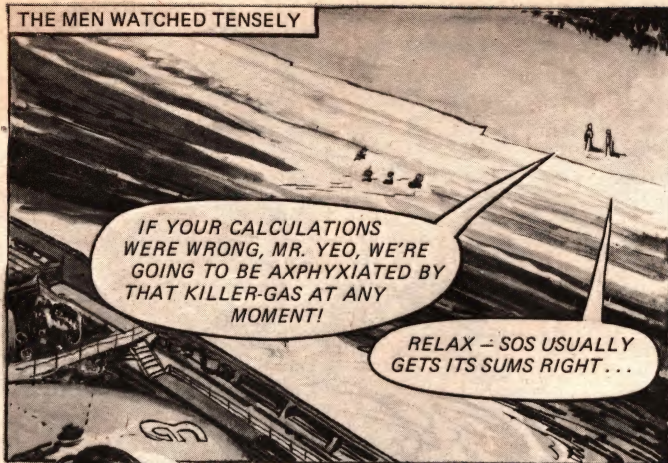
IT MIGHT WORK - IF WE ALL SYNCHRONISE THE EXPLOSIONS RIGHT, AND THEY DON'T MAKE A SIEVE OF THE GAS-TANKS AS WELL AS THE HULL!

UNDER THE TANKER'S MASSIVE HULL...



FINGERS CROSSED!

IT'S A BOLD PLAN . . . BUT WILL IT WORK?



ED COFFYN IS KNOWN FOR HIS FLASHES OF INSPIRATION. CAN HE COME UP WITH THE ANSWER?

TANGO BLUE will make a diversion strike on the first two escort vessels and Tango Red will hit the flagship cruiser."

We are in the "ready" room of the flagship of the French Navy's 11th Flotilla, the aircraft carrier *Clemenceau*, steaming with her squadron on a training exercise in Gascogne Gulf. The grey walls of the ready room contrast with the large blackboard chalked with the day's flying orders.

Officers and men take notes as the Lieutenant Commander of the Flotilla talks about the operation.

In an hour's time, the first dark grey Dassault Etendard fighter will take its place on one of the *Clemenceau's* catapults and be flown off by one of the men now taking notes in the "ready" room.

Up on the hanger deck, all is activity. Aircraft are towed by powerful tractors to the giant lifts

that will whisk them up to the flight deck.

On deck, an early morning breeze ruffles the coloured shirts of the maintenance men, as they dart around the aircraft, checking and securing and giving cockpits a final polish. Underneath the wheels of the jets, other men make sure that the mighty steam catapults are ready to boost them into the air when the time comes.

VITAL WHIRLYBIRD

Before any carrier launch, the "plane guard" helicopter—in this case an Aerospatiale Alouette III—flips off the deck. This whirlybird has a vital job—to watch all take-offs and be ready to go to the aid of a crew, should a plane ditch. When a heavy fighter is catapulted, it gathers speed very

quickly. If anything goes wrong, the pilot may sink with his aircraft, as only a few seconds will pass before he hits the sea. So the Alouette also carries a frogman, who will be winched down to the stricken aircraft for a fast rescue.

When it is time for the ship to go to action stations, each member of the crew knows his station and goes about his work quickly and efficiently.

From his lofty perch in the "island" overlooking the flight deck, the Air Chief gives orders through a microphone, which are amplified throughout the *Clemenceau*. A few feet away stands the ship's Captain, speaking with the Rear Admiral, the Flotilla Com-

mander, who is on board today.

For the first time since leaving the home port, the carrier finds good weather. Earlier, *Clemenceau's* aircraft—Dassault Etendard fighters, US-built Crusader attack planes and Breguet Alizé Anti-Submarine warfare types—had to find the ship through holes in the clouds during a storm.

A French Navy carrier does not take her aircraft into port—they fly-on after she has sailed and leave for a land base before she returns to port.

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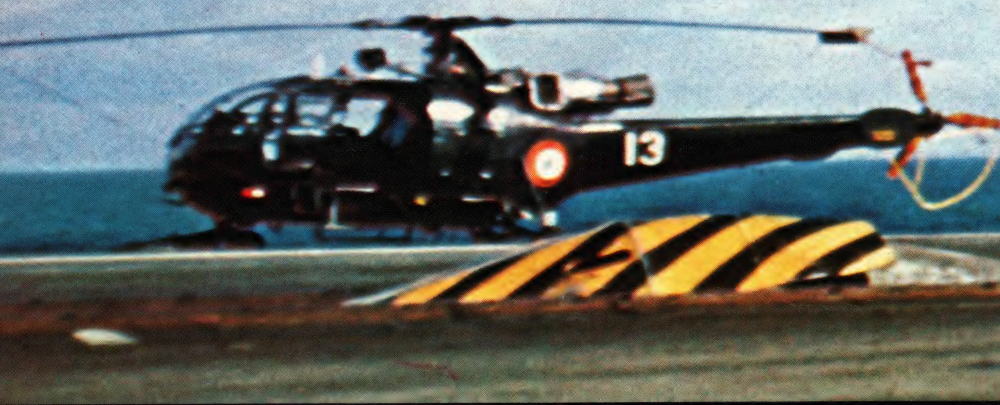
CLEMENCEAU— FRENCH SUPER CARRIER

In the last 20 years, the navies of Europe have been whittled down to a mere shadow of their former strength. Only Britain and France have managed to keep powerful sea-borne strike forces on attack aircraft carriers. France's *Clemenceau* is one of the precious few left . . .



Above: *Clemenceau's* main attack aircraft is the LTV F8 Crusader, bought from America. One is seen here zooming off the French ship's flight deck. Right: Looking like the British Gannet and doing the same job is the Breguet Alizé anti-sub aircraft.

One of the Etendard IVMs of *Clemenceau's* air group accelerates down the deck past the Alouette planeguard helicopter. Etendards—the name means “flag”—entered service with the French Navy in 1962, replacing prop-driven Corsairs. Nearly 100 were built, all single seaters. *Foch* and *Clemenceau* carry about a dozen Etendards each.



When she is at sea, *Clemenceau's* crew works round the clock, on shifts, starting at 7am. Much of the work of course, is connected with the carrier's air element. Planes have to be moved about, serviced, fuelled and “bombed up” and all the gear needed for landing and launching has to be carefully checked. It is hard work and the men naturally get hungry!

UP AT SIX!

Meals are served continuously for two to three hours, and every member of the crew has the same choice of menu.

Reveille can be an hour earlier than usual—6am—if there was flying the night before and an early morning sortie is scheduled. The aircraft have to be ready for the day's sorties as soon as possible—but the morning's weather may provide a little more rest later on!

Each French aircraft carrier has several squadrons embarked; the units have about 15 pilots each, a maintenance team of about 130

and up to 12 aircraft to look after.

Of the three types of aircraft carried by *Clemenceau*, only the Alizé and Crusader fly at night. The Etendard IVM (attack) and Etendard IVP (photographic) aircraft are only flown from the carrier during daylight hours.

Each day, a flying plan is drawn up. This is either fixed before the ship sails, or decided by the commander on the spot, especially on exercises.

Aircraft are catapulted singly or in pairs, from groups parked ready to go at the rear of the 543ft. flight deck. Machines not flying are parked at the front of the deck, as the rear section must always be kept free for landing.

When a pilot has checked the flight board and knows his orders he attends a briefing, where he is told about the weather, routes to fly, rendezvous points and so on. A squadron briefing follows and then our pilot signs for the aircraft he will fly at the Technical Aviation Bureau.

An Air Chief controls all flying by the *Clemenceau's* air group and he talks to the aircraft during their operations. One radio channel is used most of the time, as use of the “control” and “approach” frequencies is kept to a minimum. Sometimes, exercises are carried out in complete radio silence by the

ships and aircraft involved.

Monitoring Officers aboard other ships in the fleet feed information to *Clemenceau's* aircraft and pass Ground Controlled Interception information.

One by one, *Clemenceau's* aircraft shoot into the sky to carry out their missions. The fast Etendards will return first, in about an hour's time. The Crusaders will take 30 minutes longer and the Alizé prop-planes may be away on their submarine search missions for up to three hours.

FIGHTER RECOVERY

With the early morning operation over, the first Etendard screams in over the carrier's stern, its hook groping for one of the deck arrester wires. Hook caught, the sleek jet fighter slows quickly, rocking on its strong landing gear. Still moving, the aircraft's wings start to fold and it turns off the deck landing area, to make way for the next Etendard now lining up for a landing.

The pilot may now go off duty for a welcome drink and meal. He may be back on call this afternoon, or not be on the flying rota again until the next day.

When all her aircraft are safely back on board, *Clemenceau* takes her place at the head of the French

Fleet flotilla. Already, more aircraft are being brought up on deck, men are scurrying around them, making ready for the next fly-off.

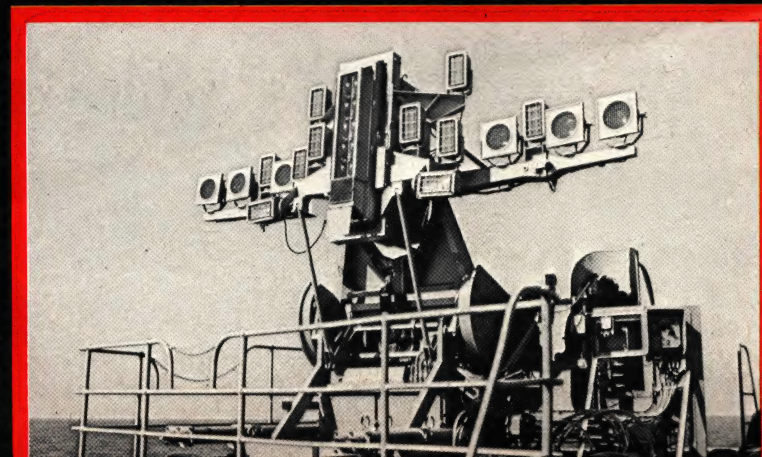
Along with her sister ship *Foch*, and Britain's *Ark Royal*, *Clemenceau* carries the NATO countries' seaborne jet strike force, with thousands of miles of European waters to patrol. So round the clock the crews work to make sure that this mighty warship is kept at her full fighting efficiency.

FACTS AND FIGURES

Clemenceau is one of two French Navy carriers in the class named after her, the other being the *Foch*. The first French-built carrier, *Clemenceau* was launched in December 1957.

Full load displacement, 32,780 tons. Overall length 869.4ft. Width, 168ft. Aircraft, 40. Steam catapults, two. Armour over flight deck, island superstructure, bridge, hull, over machinery and magazines areas. Guns, eight 3.9in. AA in single turrets. Engines, two sets of two-shaft geared turbines of 126,000shp. Speed max, 36mph. Crew, 2,239. Aircraft: Etendard IVM. Wingspan, 31ft. 6in. Length, 47ft. 3in. Max speed, 674mph. Engine, one Atar O8B turbojet. F-8E Crusader: Wingspan, 35ft. 2in. Length, 54ft. 6in. Max. speed, 1,120mph. Engine, one P & W J57 turbojet.

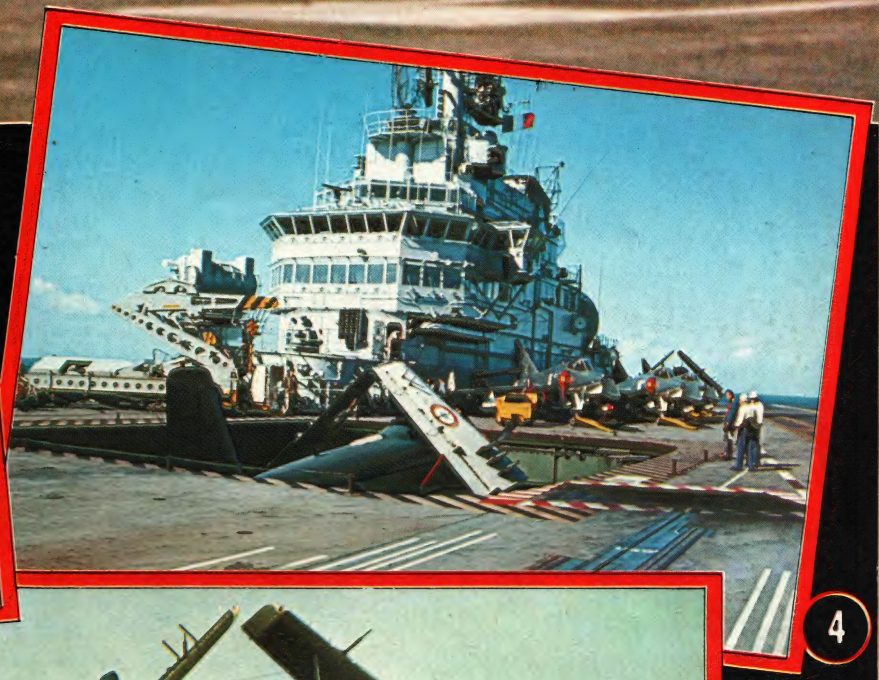
The mirror deck-landing aid used by the jets to line up their angle of approach when landing. Helicopters are still guided in by flag signals.




1. Following the deckman's red and green flag signals, the Alouette returns to its floating home. 2. The evening sun glints off the squat shape of a Crusader as it is stopped by one of *Clemenceau's* deck wires. This aircraft is the forerunner of the Corsair II, in service with the USAF and US Navy.

3. In the carrier's island, deck parking is controlled and landing and take-offs are monitored. 4. A folded Alizé comes up the forward deck lift. These potent aircraft—their name means “tradewind”—are three-seaters and they carry a wide range of electronic gear to find submarines. Attack weapons are carried in the bomb bay and on wing racks. 5. Deck activity round an Alizé that has just landed.

6. *Clemenceau* under way, seen from the cockpit of the Alouette. A parade is being held on the flight deck, with Alizé and Etendard aircraft parked on deck forward of the island, and an Alizé aft, behind the giant “football” of the ship's aircraft approach control radar.



An illustration depicting a scene from a story. In the upper left, two men stand on a balcony. The man on the left, wearing a green suit and brown trousers, is gesturing with his right hand while speaking. The man on the right, wearing a brown leather jacket and grey trousers, listens intently. In the background, a large stone pillar and a railing are visible. Below them, a black and red jet flies over a lush green landscape with a body of water and a distant mountain. The jet has a single engine mounted on its back and a red stripe along its fuselage.

I worried all the way to the Russian Embassy.

WHEN the switchboard said that the Soviet Embassy was on the line, my first reaction was: "Good—another job!" But the moment I heard Goncharov's voice, I knew there was trouble.

"Klaus? This is Mikhail. Can you come over at once? It's very urgent, and I can't talk on the phone."

I worried all the way to the Embassy, marshalling my defences in case anything had gone wrong at our end. But I could think of nothing; at the moment, we had no outstanding contracts with the Russians. The last job had been completed six months ago, on time, and to their entire satisfaction.

Well, they were not satisfied with it now, as I discovered quickly enough. Mikhail Goncharov, the Commercial Attaché, was an old friend of mine; he told me all he knew, but it was not much.

"We've just had an urgent cable from Sri-Lanka," he said. "They want you out there immediately. There's serious trouble at the hydrothermal project."

"What sort of trouble?" I asked. I knew at once, of course, that it would be the deep end, for that was

The SHIPING ONES

Arthur C. Clarke
Part 1

Were there intelligent
creatures 3,000 feet
down in the Indian Ocean?

the only part of the installation that had concerned us. The Russians themselves had done all the work on land, but they had had to call on us to fix those grids three thousand feet down in the Indian Ocean. There is no other firm in the world that can live up to our motto: *Any Job, Any Depth.*

"All I know," said Mikhail, "is that the site engineers report a complete breakdown, that the Prime Minister of Sri-Lanka is opening the plant three weeks from now, and that Moscow will be very, very unhappy if it's not working then."

My mind went rapidly through the penalty clauses in our contract. The firm seemed to be covered, because the client had signed the take-over certificate, thereby admitting that the job was up to specification. However, it was not as simple as that; if negligence on our part was proved, we might be safe from legal action—but it would be very bad for business. And it would be even worse for me, personally; for I had been project supervisor in Trinco Deep.

MINISUB

Don't call me a diver, please; I hate the name. I'm a deep sea engineer, and I use diving gear about as often as an airman uses a parachute. Most of my work is done with TV and remote-controlled robots. When I do have to go down myself, I'm inside a minisub with external manipulators. We call it a lobster, because of its claws; the standard

model works down to five thousand feet, but there are special versions that will operate at the bottom of the Marianas Trench. I've never been there myself, but will be glad to quote terms if you're interested. At a rough estimate, it will cost you a dollar a foot plus a thousand an hour on the job itself.

I realised that the Russians meant business when Mikhail said that a jet was waiting at Zurich, and could I be at the airport within two hours?

"Look," I said, "I can't do a thing without equipment—and the gear needed even for an inspection weighs tons. Besides, it's all at Spezia."

"I know," Mikhail answered implacably. "We'll have another jet transport there. Cable from Sri-Lanka as soon as you know what you want: it will be on the site within twelve hours. But please don't talk to anyone about this; we prefer to keep our problems to ourselves."

I agreed with this, for it was my problem, too. As I left the office, Mikhail pointed to the wall calendar, said "Three weeks," and ran his finger around his throat. And I knew he wasn't thinking of *his* neck.

Two hours later I was climbing over the Alps, saying good-bye to the family by radio, and wondering why, like every other sensible Swiss, I hadn't become a banker or gone into the watch business. It was all the fault of the Picards and Hannes Keller, I told myself moodily; why did they have to start this deep-sea tradition, in Switzerland of all countries? Then I settled down to sleep, knowing that I would have little enough in the days to come.

We landed at Trincomalee just after dawn, and the huge, complex harbour—whose geography I've never quite mastered—was a maze



"What's the trouble?" I said, as we drove off. "We don't know," said Lev. "It's your job to find out—and to put it right".

of capes, islands, interconnecting waterways, and basins large enough to hold all the navies of the world. I could see the big white control building, in a somewhat flamboyant architectural style, on a headland overlooking the Indian Ocean. The site was pure propaganda—though of course if I'd been Russian I'd have called it "public relations."

A MILE DOWN

Not that I really blamed my clients; they had good reason to be proud of this, the most ambitious attempt yet made to harness the thermal energy of the sea. It was not the first attempt. There had been an unsuccessful one by the French scientist Georges Claude in the 1930's, and a much bigger one at Abidjan, on the west coast of Africa, in the 1950's.

All these projects depended on the same surprising fact: even in the tropics the sea a mile down is almost at freezing point. Where billions of tons of water are concerned, this temperature difference represents a colossal amount of energy—and a fine challenge to the engineers of power-starved countries.

Claude and his successors had tried to tap this energy with low-pressure steam engines; the Russians had used a much simpler and more direct method. For over a hundred years it had been known that electric currents flow in many materials if one end is heated and the other cooled, and ever since the 1940's Russian scientists had been working to put this "thermoelectric" effect to practical use. Their earliest devices had not been very efficient—though good enough to power thousands of radios by the heat of kerosene lamps. But in 1974 they had made a big, and still-secret, break-through. Though I fixed the power elements at the cold end of the system, I never really saw them; they were completely hidden in anticorrosive paint. All I know is that they formed a big grid, like lots of old-fashioned steam radiators bolted together.

FULL-POWER TESTS

I recognised most of the faces in the little crowd waiting on the Trinco airstrip; friends or enemies, they all seemed glad to see me—especially Chief Engineer Shapiro.

"Well, Lev," I said, as we drove off in the station wagon, "what's the trouble?"

"We don't know," he said frankly. "It's your job to find out—and to put it right."

"Well, what happened?"

"Everything worked perfectly up to the full-power tests," he answered.

CONTINUED ON NEXT PAGE





wered. "Output was within five per cent of estimate until 0134 Tuesday morning." He grimaced; obviously that time was engraved on his heart. "Then the voltage started to fluctuate violently, so we cut the load and watched the meters. I thought that some idiot of a skipper had hooked the cables—you know the trouble we've taken to avoid *that* happening—so we switched on the searchlights and looked out to sea. There wasn't a ship in sight. Anyway, who would have tried to anchor just *outside* the harbour on a clear, calm night?

SOLAR POND

"There was nothing we could do except watch the instruments and keep testing; I'll show you all the graphs when we get to the office. After four minutes everything went open circuit. We can locate the break exactly, of course—and it's in the deepest part, right at the grid. *It would* be there, and not at *this* end of the system," he added gloomily, pointing out the window.

We were just driving past the Solar Pond—the equivalent of the boiler in a conventional heat engine. This was an idea that the Russians had borrowed from the Israelis. It was simply a shallow lake, blackened at the bottom, holding a concentrated solution of brine. It acts as a very efficient heat trap, and the sun's rays bring the liquid up to almost two hundred degrees Fahrenheit. Sub-

merged in it were the "hot" grids of the thermoelectric system, every inch of two fathoms down. Massive cables connected them to my department, a hundred and fifty degrees colder and three thousand feet lower, in the undersea canyon that comes to the very entrance of Trinco harbour.

"I suppose you have checked for earthquakes?" I asked, not very hopefully.

"Of course. There was nothing on the seismograph."

"What about whales, I warned you that they might give trouble."

More than a year ago, when the main conductors were being run out to sea, I'd told the engineers about the drowned sperm whale found entangled in a telegraph cable half a mile down off South America. About a dozen similar cases are known—but ours, it seemed, was not one of them.

"That was the second thing we thought of," answered Shapiro. "We got on to the Fisheries Department, the Navy, and the Air Force. No whales anywhere along the coast."

It was at that point that I stopped theorizing, because I overheard something that made me a little uncomfortable. Like all Swiss, I'm good at languages, and have picked up a fair amount of Russian. There was no need to be much of a linguist, however, to recognize the word *sabotash*.

It was spoken by Dimitri Karpukhin, the political adviser on the project. I

I turned on the low-powered jets and let the camera drift down the power cables.

The self-propelled camera went over the side.

didn't like him; nor did the engineers, who sometimes went out of their way to be rude to him. One of the old-style Communists who had never quite escaped from the shadow of Stalin, he was suspicious of everything outside the Soviet Union, and most of the things inside it. Sabotage was just the explanation that would appeal to him.

There were, of course, a great many people who would not exactly be brokenhearted if the Trinco Power Project failed. Politically, the prestige of the USSR was committed; economically, billions were involved, for if hydrothermal plants proved a success, they might compete with oil, coal, water power, and, especially, nuclear energy.

CLEAR WATER

Yet I could not really believe in sabotage; after all, the Cold War was over. It was just possible that someone had made a clumsy attempt to grab a sample of the grid, but even this seemed unlikely. I could count on my fingers the number of people in the world who could tackle such a job—and half of them were on my payroll.

The underwater TV camera arrived that same evening, and by working all the night we had cameras, monitors, and over a mile of co-axial cable loaded aboard a launch. As we pulled out of the harbour, I thought I saw a familiar figure standing on the jetty, but it was too far to be certain and I had other things on my mind. If you

must know, I am not a good sailor; I am only really happy *underneath* the sea.

We took a careful fix on the Round Island lighthouse and stationed ourselves directly above the grid. The self-propelled camera, looking like a midget bathyscaphe, went over the side; as we watched the monitors, we went with it in spirit.

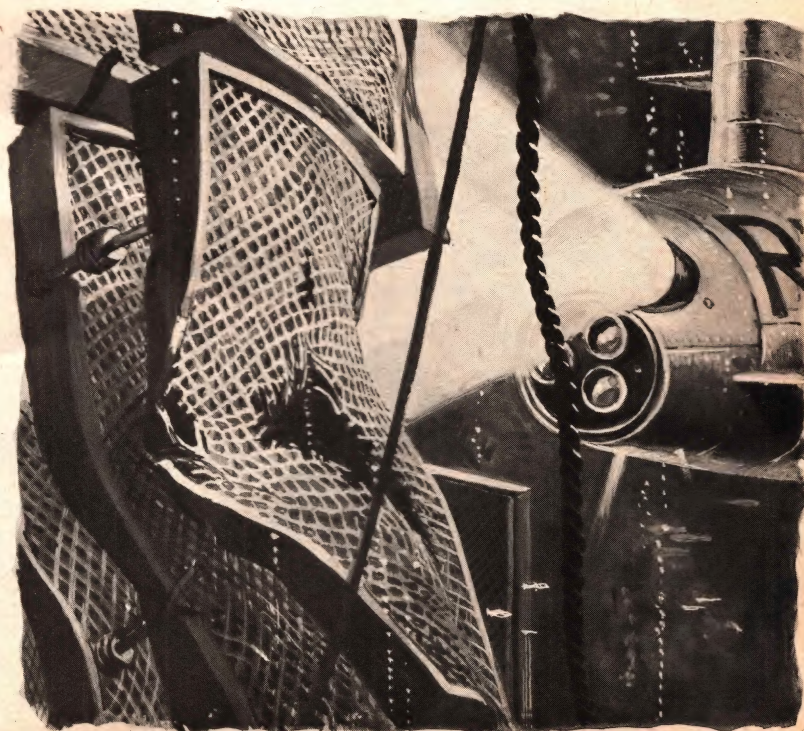
The water was extremely clear, and extremely empty, but as we neared the bottom there were a few signs of life. A small shark came and stared at us. Then a pulsating blob of jelly went drifting by, followed by a thing like a big spider, with hundreds of hairy legs tangling and twisting together. At last the sloping canyon wall swam into view. We were right on target, for there were the thick cables running down into the depths, just as I had seen them when I made the final check of the installation six months ago.

I turned on the low-powered jets and let the camera drift down the power cables. They seemed in perfect condition, still firmly anchored by the pitons we had driven into the rock. It was not until I came to the grid itself that there was any sign of trouble.

Have you ever seen the radiator grille of a car after it's run into a lamppost? Well, one section of the grid looked very much like that. Something had battered it in, as if a madman had gone to work on it with a sledgehammer.

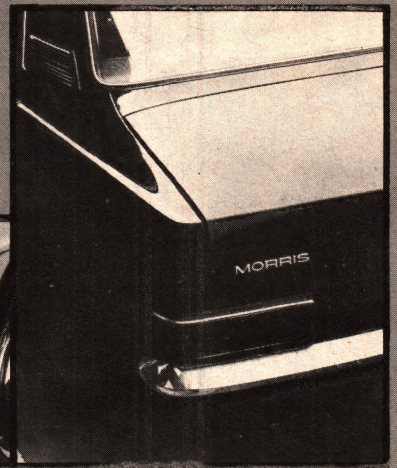
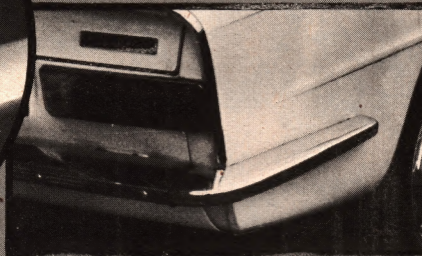
© Arthur C. Clarke 1962

NEXT WEEK: Face to face with The Shining Ones.

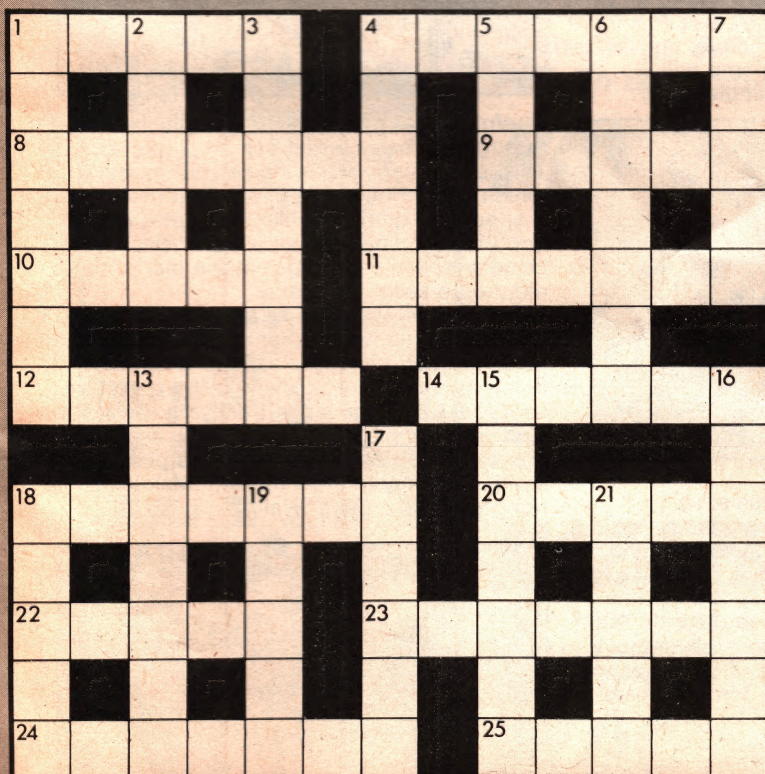
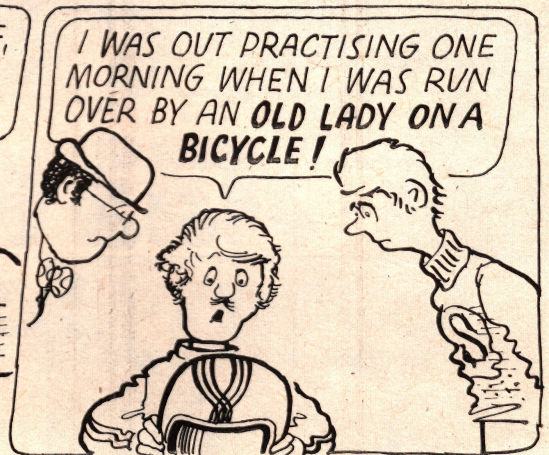
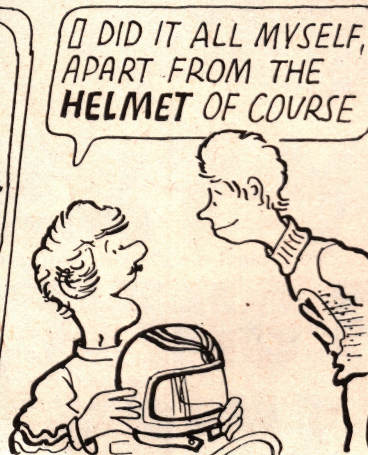
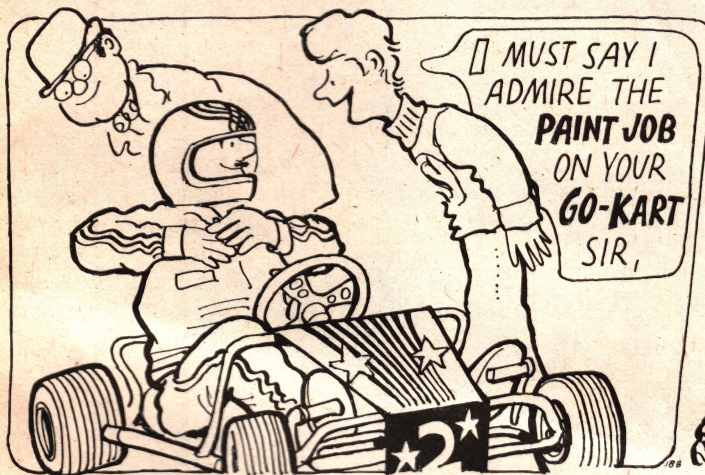


Quick Quiz

From these rear views of vehicles, see if you can tell their makes. The answers are on page 31



SPEEDO and PA



CROSSWORD

ACROSS

1. They make motoring more comfortable! (5).
4. Speak very quietly (7).
8. Describes the period before you become a man (7).
9. Larvae of insects (5).
10. Play unfairly (5).
11. Describes a day from Monday to Friday (7).
12. Famous university centre (6).
14. Ancient burial place (6).
18. One of the earliest man-made boats (7).
20. Claw of a bird (5).
22. Wall painting (5).
23. Canadian city (7).
24. Not so dirty (7).
25. Scouts try to do good ones (5).

DOWN

1. It is usually smoked (7).
2. His name always goes with Rolls (5).
3. He may keep an enthusiastic eye on trains, planes and cars, etc. (7).
4. Women who have lost their husbands (6).
5. Fireplace, usually of brick and large enough to sit inside (5).
6. Steal the enemy's possessions in war time (7).
7. Metal goes like this unless it is kept painted (5).
13. It grows in temperate zones and has cones (3, 4).
15. Changed (7).
16. They are usually filled with glass (7).
17. You may write one to a friend (6).
18. He should make you laugh (5).
19. Punctuation mark formed with two full stops (5).
21. Long, sharp-pointed weapon (5).

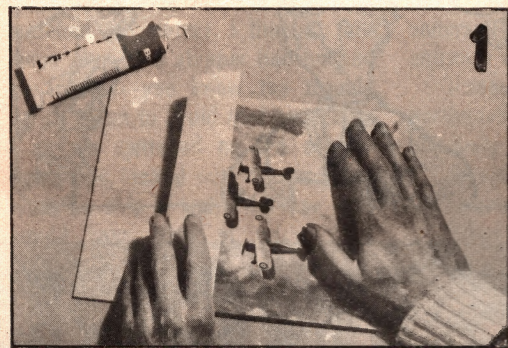
SOLUTION ON PAGE 31

Planes in a PICTURE



WHAT YOU NEED

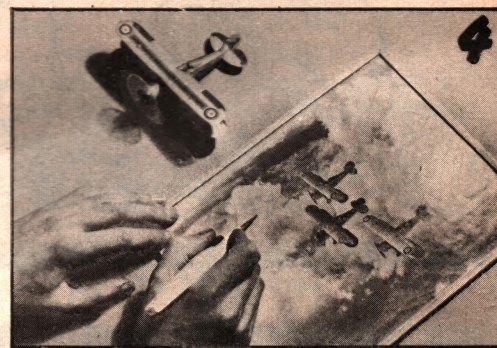
$\frac{1}{8}$ -inch by 4-inch sheet balsa wood
 $\frac{1}{2}$ -inch by $\frac{1}{2}$ -inch strip balsa wood
 Sheet of clear plastic
 Balsa cement Polystyrene cement
 Clear adhesive
 A sharp craft knife



First, select a suitable photograph. We got ours from the magazine *Aeroplane Monthly*. The aircraft in the photograph should be smaller than your model, to create the proper perspective. Next you need some $\frac{1}{8}$ -inch sheet balsa wood; we used two pieces of four-inch wide balsa glued side-by-side to provide a piece the same size as our photo.

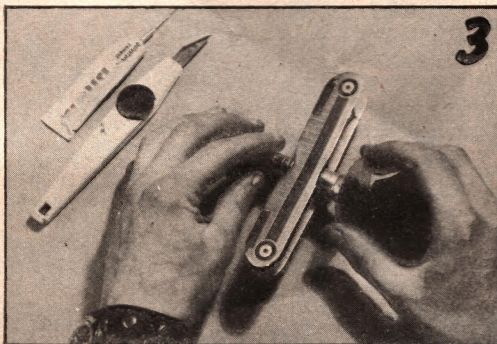
Coat the balsa wood with clear adhesive, and do the same with the back of your picture. Then, making sure there are no air bubbles, glue the picture to the balsa (pic 1).

To provide a frame for the picture, and to reinforce it, use $\frac{1}{2}$ -inch square strip balsa. Cut each frame section at an angle of 45



carefully cut a narrow slit in the picture and through the balsa wood behind it (pic 4). This is to accept one wing of your model, which should be eased gently into the balsa. It should be quite firm like this, but it is a good idea to coat the wing with balsa cement where it protrudes at the rear of the picture, to keep it in place.

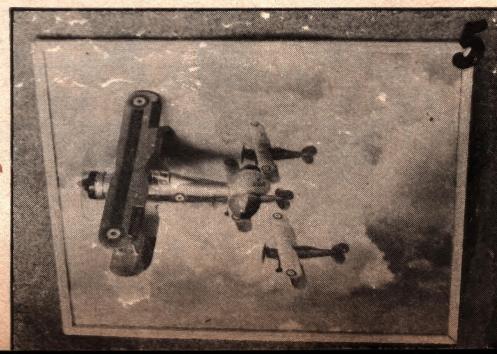
Your model will look as though it is flying through the air, with other aircraft in the distance! You can make variations on this theme by fixing the tailplane into the picture, so it looks as if the aircraft is flying toward you, for example. Two small screw eyes in the rear of the picture, joined by a piece of string, will enable the picture-model to be hung proudly on your wall.



degrees, just like a painting frame, using a sharp craft knife. When these are ready, and checked for fit, you can glue them in place with balsa cement (pic 2).

Now to the model itself. Ours is an Airfix Gloster Gladiator. To give the impression that the aircraft is actually flying, carefully remove the propeller and affix a circle of clear plastic sheet (from model shops) the same diameter as the propeller. Cut the propeller blades off and glue the spinner or hub back into position on the aircraft (pic 3). The propeller now looks as though it is revolving!

When you have decided whereabouts on the picture you want the model to lie,





Model Spot

PUTTING LIFE INTO A KIT

Model aircraft posed in front of a realistic background look much better than those left on a windowsill or shelf, as the dramatic photograph (left) proves. This was taken by SPEED & POWER reader H. R. Archer and shows an Airfix 1/24 scale Mustang being pursued by an ME-109, which is 1/72 scale. The models were cleverly positioned in front of a large air-to-ground print for the photograph. By following our instructions, you too can make a realistic air scene with any plane kit.

NEXT WEEK

500 FLYING FORTRESSES TO BE WON!

Yes—Here's a great chance for you to win a terrific Airfix model kit of the battling B-17 bomber. The competition is *free-to-enter*, and easy, too! So don't miss it.

HOT ROD RACERS...

As little as £200 buys a Hot Rod Anglia, Mini or Escort and puts this new form of motor racing within the reach of every would-be champ.

...AND HOT ROD BOMBER!

Skyhawk—the fantastic American combat bomber that also thrills crowds with its *aerobatic* antics!

HAZARDOUS CARGO!

Explosive gases, bubbling acids, poisonous chemicals—just a few of the problems faced by the seamen who sail huge chemical tankers across the oceans of the world.

PLUS

Many more exciting stories on RACE-TRACK SAFETY, WARPLANES, DIESEL TRAINS, TRUCKS, SCIENCE FICTION and the final thrilling instalment of SOS INTERNATIONAL. Don't be disappointed—order your copy from your newsagent NOW!

Q

QUICK QUIZ ANSWERS

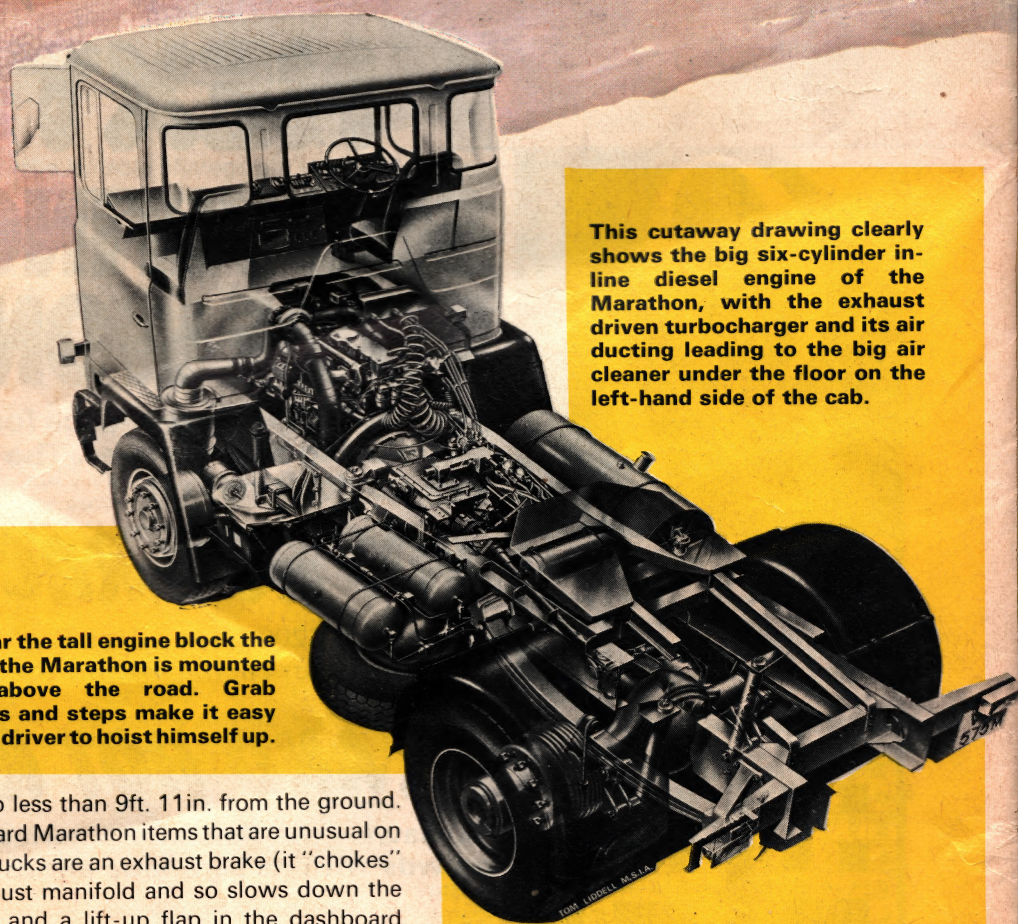
1—Mini Clubman. 2—Ford Cortina Mk 1. 3—Ford Transit van. 4—Jaguar XJ6 2.8. 5—Triumph 1500. 6—Morris Marina.

CROSSWORD SOLUTION

1	T	Y	R	E	S		4	W	H	I	S	6	P	E	R
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	C				E		S							E	
12	O	X	F	O	R	D		14	B	A	R	R	O		W
18	C	O	R	A	C	L	E		20	T	A	L	O	N	
	O		T		O		T			E		A		D	
22	M	U	R	A	L			23	T	O	R	O	N	T	O
	I		E		O		E					E	C	W	
24	C	L	E	A	N	E	R		25	D	E	E	D	S	



Ridin' High in the Marathon



This cutaway drawing clearly shows the big six-cylinder in-line diesel engine of the Marathon, with the exhaust driven turbocharger and its air ducting leading to the big air cleaner under the floor on the left-hand side of the cab.

To clear the tall engine block the cab of the Marathon is mounted high above the road. Grab handles and steps make it easy for the driver to hoist himself up.

A REAL FLYER"—that's how British truck drivers are describing the Leyland Marathon, which has been on the road for a little over a year and is only now beginning to be seen in numbers on the main routes and motorways. With 272 bhp under the bonnet—or, rather, under the floor—and a nine-speed gearbox, it covers the ground at a pace that few heavy trucks can match. On mixed motorway and normal main road work it will easily average, point-to-point, over 40mph fully laden, without exceeding the speed limits, though it is capable of around 65mph in overdrive.

HIGH-UP CAB

It's a long climb for the driver into a cab built to clear the rather tall six-cylinder in-line engine but the steps and grab-handles make it an easy ascent, and once in his seat he has a wonderful view over other traffic; the top of the Marathon

cab is no less than 9ft. 11in. from the ground.

Standard Marathon items that are unusual on British trucks are an exhaust brake (it "chokes" the exhaust manifold and so slows down the engine), and a lift-up flap in the dashboard which reveals all the fuses and the pressure relay valves in one neat layout, with a coded diagram to identify them. Useful when something blows on a wet night—no more underbonnet groping in the dark.

The Marathon is the most powerful and highest-rated of Leyland's roadgoing trucks—there are models up to 44 tons capacity—and it costs £10,700.

IN BRIEF: Leyland MTL 38.28F Marathon 32-ton tractive unit with TL 12 12.47-litre six-cylinder turbocharged diesel engine developing 272bhp at 2200rpm. Twin-plate 14in. clutch, nine-speed constant-mesh Fuller gearbox and Leyland hub-reduction rear axle. Wheelbase 10ft. 3in. Power-assisted steering. Full compressed-air braking system. 75-gallon capacity fuel tank.